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DIFFERENCES IN RADIO FREQUENCY ASSIGNMENTS BETWEEN NATIONS: A CORRELATIONAL ANALYSIS

presented by

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Bella Mody

Major professor

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DIFFERENCES IN RADIO FREQUENCY ASSIGNMENTS BETWEEN NATIONS: A CORRELATIONAL ANALYSIS

By

Regenie F. Ch. Fräser

A THESIS

Submitted to
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ABSTRACT

DIFFERENCES IN RADIO FREQUENCY ASSIGNMENTS BETWEEN NATIONS: A CORRELATIONAL ANALYSIS

By

Regenie F. Ch. Fräser

This exploratory study attempts to understand complaints made by Third World Countries, alleging unfair distribution of radio frequencies recognized by the International Telecommunication Union.

This study combines historical analysis, comparative analysis, relationship analyses, and contextual analysis.

Differences in technological development explain most variance (R=75%) in the number of frequency assignments to all countries in the global analysis. A regional analysis (Asia, Europe-Africa, the Americas) shows frequency assignments differ from region to region. An analysis of selected countries in the Americas presented a different set of variables most correlated to frequency assignments, thus affirming the importance of contextual analysis.

The First Come, First Served principle, and the policy concerning Modification, Cancellation and Review of Entries in the Master Register of the International Telecommunication Union are analyzed for their role in frequency assignments.

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I would like to thank a number of people who made it possible for me to attend Michigan State University and complete this thesis.

First of all, I would like to thank my very dear friend, Walter Greaves whose assistance was crucial in my gaining acceptance into Michigan State University. Walter did far more to help me than I could reasonably expect from any other friend. A very special place is reserved for my parents and family whom throughout the years and particularly during my stay at Michigan State University, provided the support which made all the successes of my life possible. Here I would like to acknowledge them individually; my parents, Louis and Romana Fräser; my brothers and sisters and their families; Ramon, Iwan, Henna, Marléne, Mavis and Floyd.

To the Organization of American States, I would like to express my thanks for the financial assistance that they have extended to me. I must also thank my once and future employer, the Telecommunication Corporation Suriname, for granting me leave of absence and financial assistance during my stay at Michigan State University.

In order to gather data necessary to complete my thesis, I visited the ITU Headquarters in Geneva for four days. I would like to thank the following people for the

assistance they provided, while I was there: Mr. M.D. Sant, Head of the Office of the IFRB, Mr. J. Balfroid, Head of the Registration and Publications Division and Operations Department of the IFRB, Mr. J. Lewis, Head of the Data Entry and Validation Division of the IFRB, Mr. R. Fontaine, Chief Public Relations Divisions and Editor-in-chief, Telecommunication Journal, as well as Mrs. Jane Pellaux-da Silva and Mr. Kaïss El Hay of the ITU Library.

Success at the graduate level is quite impossible without the guidance of concerned and thoughtful professors. In this regard, my sincerest thanks go to my Committee Chair, Dr. B. Mody; Committee Member, Dr. C. Steinfield and Academic Advisor, Dr. J. Straubhaar.

Finally, I would like to thank the following friends for having lent me their time in the preparation of this thesis, Anthony Cheeseboro and Louis Rankine.

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INTRODUCTION

The dynamic pace of modern society is unimaginable and quite probably, untenable without all the facilitating inputs of modern telecommunication. Radio frequency assignments are vital and necessary for national development as well as for international telecommunication. This thesis attempts to set forth demographic, sociographic, geographic and econometric reasons for the variance among radio frequency assignments between nations. This is important because radio frequency assignments are vital and necessary for national development as well as for international telecommunication.

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ORGANIZATION OF STUDY

Chapter One entitled the Framework of Investigation, consists of the problem statement, the purpose of the study, the hypothesis, the rationale for the hypothesis and the methodology.

Chapter Two is called An Introduction to the International Telecommunication Union (ITU).

Chapter Three, Frequency Assignments and Frequency Distribution Globally and Regionally, discusses the basic ITU principles guiding internationally recognized frequencies and analyzes the differences in frequency assignments, worldwide and on a regional basis.

Chapter Four, Relationships Between Frequency Assignments Per Country and Selected Characteristics, investigates the relationships of selected variables to the number of frequency assignments per country.

Chapter Five deals with relationships between frequency assignments and selected characteristics in Region 1, Region 2, and Region 3.

Chapter Six, Relationships Between Frequency Assignments and Selected Characteristics: A Closer Look at Selected Countries in Region Two, analyzes the context in which the frequencies assigned to selected countries in the Americas were obtained.

Chapter Seven is the Summary, Recommendations, and Conclusions.

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Chapter 1

FRAMEWORK OF INVESTIGATION

Problem, Purpose, Terminology, Hypothesis, Rationale and Methodology

The differences between frequency assignments among the ITU member nations constitutes some of the most apparent inequalities in the field of international telecommunication.[1,2] An examination of the statistics of frequency assignments to developing nations will reveal that, in comparison with frequency assignments to developed nations, a sharp quantitative difference exists (see Table 3). The difference is great, and if criteria of economic development and levels of technological and industrial advancement are accepted as determinants, then, the discrepancies are not surprising.

Problem Statement

The ITU's structural and policy guidelines have been a focus of concern for some developing country ITU member nations. An apparent disparity is evidenced in the approximately 90 to 10 percent ratio in frequency distribution between the developed and the developing nations.[3]

According to Bowie's analysis (1984), the developing nations, which together accounts for two thirds of the world's population; possess less than 10 percent of the

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radio spectrum. This has left the less populated developed nations with the lion's share (90 percent) of the radio frequency spectrum.[4]

The notification and registration of radio frequencies with the ITU's International Telecommunication Registration Board, is customarily and traditionally handled on a "first come, first served" basis. Essentially, "first come, first served" indicates that whoever develops a use for a given frequency first and notified IFRB of this intended use establishes a claim to protection from harmful interference. One direct consequence of this practice is that countries which are making advances in economic and technological development require and acquire spectrum space earlier than countries that are less industrially and technologically developed. In other words, the industrialized nations which are active in the innovation and application of communication technologies, naturally apply for the frequencies when their technological advancements necessitate. Therefore, these countries almost always acquire frequencies before lesser developed nations are in a position to make requests for similar frequencies. The problematic impact of such a mode of frequency acquisition is not too difficult to decipher; the bulk of the frequency assignments have been assigned to the developed countries.

Masmoudi (1984) has noted that a mode of acquisition as mentioned above implicitly contains a <u>de facto</u> hegemony

and a tendency to perpetuate an imbalance and dominance by certain states. Access to the radio spectrum is, de facto, based on industrial, technological, economic and power politics. Countries without acknowledged strengths in these national appurtenances are relegated to a consumer status which engenders an extreme vulnerability to the dictates of the more developed nations.[5]

The nations who have traditionally been the victims of this imbalance have also, traditionally regarded the existing assignment mechanism as inadequate. These concerns have been manifested in a series of adjustment efforts proposed by these disadvantaged nations in frequency management conferences since 1959. The 1959 World Administrative Radio Conference dealt with the revision of the Radio Regulations. In this conference, proposals were tabled which aimed at achieving changes in the areas of:

a. European long and medium wave broadcasting satellite frequencies and

b. orbital positions for satellites belonging to various member nations. While this was achieved in Region 1 and 3, between 1974 and 1975 respectively, no concessions, adjustments or accommodations took effect within the nations of Region 2. The 1981 regional medium wave conference failed to reach a decision on a proposal to reduce channel spacing. The primary reason for this failure was attributed to political disagreement between

Cuba and the United States of America. In 1985, the Space WARC(World Administrative Radio Conference) was required to pursue an objective which would guarantee "equitable access" to orbit and frequency spectrum resources for all nations.[6]

Though studies have been carried out to examine the disparity of spectrum assignments, few studies have been carried out to identify the genesis of this disparity. This exploratory case study attempts to understand complaints made by Third World Countries, alleging unfair distribution (of assignments) of radio frequencies, by the International Telecommunication Union. The study will attempt to investigate the validity of these complaints.

Purpose

This study, in the broadest sense, deals with issues of international radio spectrum assignment. In a specific sense, it is a study about parity in frequency assignment among the ITU members of Region 2. It is expected that this study will facilitate the general understanding of the existing ITU structure and its policies guiding frequency assignments. This then will lead to a better understanding of the reasons behind ITU member nations having varying and different sometimes, allegedly disproportionate, numbers of frequencies. Howkins (1979:11), has correctly asserted that the radio spectrum can be

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misused when used too much, particularly when the result is interference. Conversely, the spectrum is wasted when it is used to little. Among his main conclusions he made note that, "more than any other resource, perhaps, the spectrum requires careful management. It requires it on a global scale, yet to a fine degree.[7]

Terminology

According to the ITU the terms for frequency distribution are: allocation for services; allotment for areas or countries; and assignment for stations.[8] An assignment (of a radio frequency channel): is the "authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions."[9] This thesis is concerned only with certain frequency assignments to radio stations. From this definition we learn that frequencies are assigned by the "Administrations"[10] and not by the International Frequency Registration Board (as commonly understood). One of the functions of the IFRB is, "the processing of the frequency assignment notices."[11]

The world has been divided into three geographical regions for the allocation of frequencies. These ITU regions are: Region 1, constituting Africa and Europe, including the USSR; Region 2 is essentially the Americas, including Greenland; and Region 3 is Asia (Asiatic USSR

excluded) and Australasia.[12] Appendix B gives a schematic presentation of these three regions. Region 2, comprising the Americas (North and South), and some Atlantic and Pacific Islands, provides a good area for the assessment of the genesis of the disparity in frequency assignments. Region 2 has the fewest total number of ITU members (N=37), as compared to Region 1 (N=83) and Region 3 (N=48). As a consequence spectrum space shortage in Region 2 is less of a problem than in the other regions. Because of this fact differences in frequency assignments in Region 2 can be more easily/objectively assessed. My interest of Region 2 is also personal in nature. Specifically, I am a native of Region 2 and I will be working in this region in the foreseeable future.

Hypothesis Formulation

The confluence of a number of variables would seem to exert influence in the ITU frequency assignment mechanism. These factors are:

1. Age of the Nation
2. Length of Membership in the ITU
3. Political Alignment of the Nation
4. Number of Telephones
5. Number of Radios
6. Number of Television Sets
7. Number of Daily Newspapers in Circulation per 1000

people

8. Number of Computer Units (only for Latin America)

9. Kind of Economy

10. Gross National Product

11. Per Capita Income

12. Population Size

13. Country Size

14. Education

My major hypothesis is:

> A nation's political alignment, economic and technological development, its economic and political history, size of population, geographical area and national literacy level will be highly correlated to the number of frequencies registered with the International Telecommunication Union.

Rationale for the Hypothesis and Methodology

We believe that these variables will be highly correlated to radio frequency assignments because according to Masmoudi (1984), access to the radio spectrum is de <u>facto</u> based on industrial, technological, economic and power politics.[13] Additionally, the older nations tend to be older members of the ITU, which in turn seem to be industrialized and highly literate. Furthermore, most highly populated and large countries appear to have relatively large numbers of frequencies.

Method of Measurement and Relevance of Variables

The numbers of frequencies were measured in terms of the total number of assignments registered by the ITU, per country. This variable is the focus of the inquiry, in light of the complaints of some Third World Countries that a disproportionate part of the radio frequency spectrum has been assigned to the First World, while they (the TWC's) do not have enough frequencies to work with. In his study, Masmoudi found that the Third World uses 10% and the First World, 90% of all the available frequencies.[14]

The variables Age of the nation and the Length of each nation's membership in the ITU[15,16] were considered influential because we initially observed that the older nations are also old members of the ITU. Most are industrialized or industrializing, some were colonizers, and as a category, they use large numbers of frequencies. On the other hand, the new nations started joining the ITU immediately after gaining their independence in the period which stretches from the 1940s to the late 1960s and onwards. These nations are in the developing stage and they also use small numbers of frequencies.

Political alignment was categorized as: pro-west, nonaligned or socialist.[17] Since this variable has a nominal scale, an Anova test was conducted. This variable is important since political alignment must be juxtaposed with the apolitical but technical nature of the ITU, in all

instances. We predict that this variable will be highly, positively, and significantly related to the number of frequency assignments. It is suspected that this will be the case because the industrialized Western nations generally have higher per capita incomes and higher economic and technological developments than the countries of the Eastern Bloc and the non-aligned movement. Understandably, these pro-western nations are the members of the ITU that contribute more to the maintenance of the ITU.

The level of technological development was measured in terms of numbers of telephones, radios, and television sets. Additionally, the circulation of daily newspapers and, for Latin-America only, the numbers of computer units in use, were measured.

The size of the GNP's and per capita incomes were included in the correlation analysis. The kind of economy was classified into industrial market economies; high income oil exporters; East European non-market economies; middle-income developing economies and; low-income developing economies.[18] This variable was also analyzed through a Anova test because it is a nominal scale variable. Kind of economy seems to be related to the number of frequency assignments because the most economically advanced nations tend to have the highest numbers of frequencies.

Size was measured on two dimensions: population, and land area in sq. mi. There are two major reasons for

the inclusion of these variables. First, the number of people, in and the geographical area of a country appears to influence the number of frequency assignment (see Region 2, chapter 3). Second, arguments based on a combination of the variables population size and land area were offered as rationales for the exercise of more votes in the ITU.[19] These factors might soon be offered as rationale for access to more frequencies.

Education was measured by charting literacy rates in percentages of the populations. This variable was included because of its potential relationship with the level of economic and technological development in a country.

Four different yet complementary theoretical frameworks are combined in this research. These frameworks are:

a. historical analysis

b. comparative analysis

c. relationship analyses

d. contextual analysis

The historical analysis shows how the establishment of the ITU and its policies came about over time.

The comparative analysis demonstrates the differences in number of frequency assignments to ITU members worldwide. Additionally, an inter- and intra-region comparison is made.

The relationship analyses show how different variables are correlated with the number of frequencies assigned to

the ITU members. These analyses were done for the countries around the world (N=168), Region 1(N=83), Region 2(N=37) and Region 3(N=48). Furthermore, the variables (factor) which explain the most variance in the number of frequency assignments are identified and further analyzed.

The contextual analysis shows the different reasons in different contexts (countries), as presented in chapter 6.

Data Collection

Data for this thesis came from two sources. These are: secondary literature available in the library and primary data collected at the ITU Headquarters in Geneva, Switzerland. My secondary literature consists primarily of books, theses, as well as articles found in trade and scholarly journals. The quantitative information (total numbers of frequencies and length of membership in the ITU, excluded) was obtained from The World Development Report 1987 of the World Bank and The World Almanac and Books of Facts 1987/1988.

The main data received from the ITU consists of:

- a list of the total numbers of frequency assignments per ITU Region, country by country.
- the text of the International Telecommunication Convention of Nairobi, 1982, supplemented by the Radio Regulations parts One and Two, Geneva, 1986.
- the IFRB Documents of the Seminar on Frequency

Management and the Use of the Radio Frequency Spectrum and the Geostationary Satellite Orbit, Geneva, 1986.

. meetings with several staff members of the IFRB (list provided in Appendix F)

A significant highlight of my data-gathering visit to the ITU Headquarters involved being "walked-through" the entire process of notification, examination, coordination and registration of radio frequencies, by a senior IFRB staff member (see chapter 3).

After collecting the information on the variables outlined above, the Pearson Product-Moment Correlation was applied. The question to be answered here, is: To what degree does the number of frequencies(x) assigned by the ITU to its members, show interrelationships with the above mentioned independent variables(y)? This correlation was done first for 168 countries across all regions of the world, and then, on a regional basis (Region 1 - N=83, Region 2 - N=37 and Region 3 - N=48).

Because the variables Political Alignment and Kind of Economy consist of categories and not of numbers, an Analysis of Variance Test was conducted on them to find their significance to frequency assignments, in the global sample. In this sample all the independent variables except for the two categorical variables (Political Alignment and Kind of Economy) also underwent a Multiple Regression Analysis Test.

Using the symbol r to represent a coefficient of correlation, the research hypothesis is stated as: $r_{xy} \neq 0$ That is, it is predicted that the variables x and y have a correlation that differs from zero in either a negative or a positive direction. The null hypothesis is: $r_{xy} = 0$ The significance level is set at p .05

Notes Chapter 1

1. David E. Honig, "Lessons for the 1999 WARC." Journal of Communication (Spring 1980),p. 50.

Hudson estimated that 90% of the spectrum is controlled by 10% of the world's population and that the Third World with 75% of the world's population, have only 7 percent of the world's telephones.

2. The Centre for Telecommunications Development of the ITU notes that 15% of world population uses 85% of telecommunication services (see Appendix A).

3. Mustapha Masmoudi, The New World Information Order. World Communication. A Handbook. George Gerbner and Marsha Siefert, Editors. (New York: Longman Inc., 1984), pp. 19-20.

4. Nolan A. Bowie, WARC Third World Positions and Achievements. World Communication. A Handbook, George Gerbner and Marsha Siefert, (Eds.) (New York: Longman Inc., 1984), p. 425.

5. Masmoudi, p. 15.

6. Sydney A. Head, World Broadcasting Systems. A Comparative Analysis (California: Wadsworth Publishing Company, 1985), pp. 138-139.

7. Ibid, p. 131.

8. International Telecommunication Union, Radio Regulations (Geneva: General Secretariat, 1986), Art. 1, p. RR1-3.

Specific Terms Related to Frequency Management

Allocation (of a frequency band): Entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radiocommunication services or the radio astronomy service under specified conditions. This term shall also be applied to the frequency band concerned.

Allotment (of a radio frequency or radio frequency channel): Entry of a designated frequency channel in an agreed plan, adopted by a competent conference, for use by one or more administrations for a terrestrial or space radiocommunication service in one or more identified countries or geographical areas and under specified conditions.

Assignment (of a radio frequency or radio frequency channel): Authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions.

9. Ibid, Art. 1, p. RR1-8.

Station: One or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service, or the radio astronomy service.

10. Ibid, Art. 1, p. RR1-1.

Administration: Any Governmental department or service responsible for discharging the obligations undertaken in the Convention of the International Telecommunication Union and the Regulations(CONV.).

11. Ibid, Art. 10, p. RR10-1.

12. Ibid, Art. 8. p. RR8-1.

13. Masmoudi, pp. 14-27.

14. Ibid.

15. International Telecommunication Union, Liste Des Membres D L'Union De 1865 a 1965 (Geneva: Archives U.I.T., 1965), pp. 1-14.

16. Jean-Luc Renaud, The Changing Dynamics of the International Telecommunication Union: An Historical Analysis of Development Assistance. Dissertation for the Degree of Ph. D. Michigan State University, 1986, p. 332.

17. Thomas L. Mc. Phail, Electronic Colonialism. The Future of International Broadcasting and Communication (Beverly Hills: Sage Publications Inc., 1981), p. 251.

18. World Bank, The World Development Report 1987 (New-York: Oxford University Press, 1987), pp. 197-199.

19. Congress of the United States, Radio Frequency Use and Management. Impacts from the World Administrative Radio Conference of 1979 (Washington D.C.: Office of Technological Assessment, 1982), p. 117.

Chapter 2

AN INTRODUCTION TO THE ITU

Twenty three years ago, in 1965, the International Telecommunication Union (ITU) celebrated a hundred-year period of its existence as well as a period of consistently having had the largest membership of all intergovernmental organizations. It was the first intergovernmental organization to be established.[1]

What is the ITU?

The ITU presently consists of one hundred and sixty two member countries (see figure 1), which are referred to by this Union, as "Administrations". These Government representatives meet periodically in conferences and draw up by mutual agreement, rules, regulations and recommendations regarding the management of telecommunication services.[2] The Union has about 600 full-time staff members whose job is to contribute to the reinforcement of the ITU regulations on a daily basis. These activities take place in the Union's Headquarters in Geneva, where these Union officials are accommodated, including the Secretary-General and his Deputy, the members of the International Frequency Registration Board (IFRB), the Directors of the International Consultative Committees(CCITT and CCIR), engineers, administrators, linguists, secretaries, and

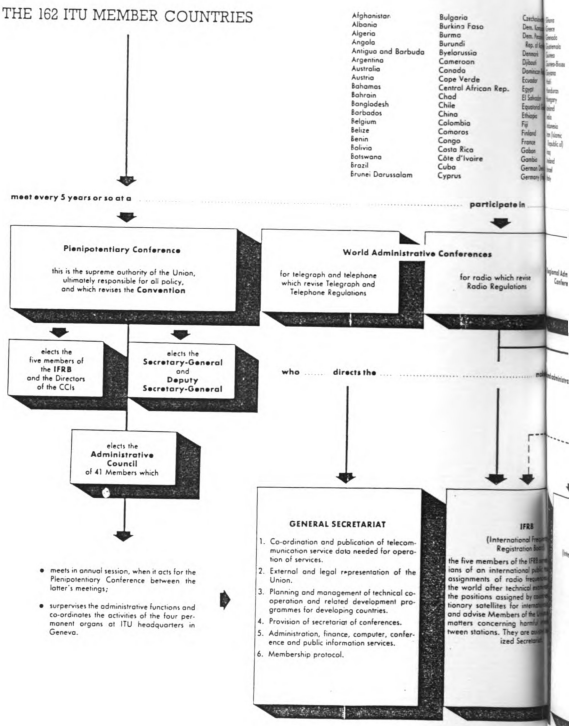
other specialists. These are just the paid staff of the ITU, they do not constitute the Union. The member countries collectively are the International Telecommunication Union, or just, the Union.[3] Figure 1, gives a schematic presentation of the Union's structure described above.

Historical

The ITU began in the early days of telegraph communication. Its genesis predates the invention of telephony or radio; events which occurred in 1876 and 1919 respectively. Telegrams, sent by wire, were then limited to points within a country, so there was no need for international cooperation or agreements. However, as services were extended and telegrams were exchanged between countries; international agreement became necessary in regard to compatible types of equipment which should be deployed; the type of coding which should be used; the rates that should be charged for the telegrams, and in regard to juridical questions then raised by telegraph wires crossing national borders. Therefore, in 1865, the first telecommunication convention was adopted and the first telegraph regulations were written in Paris, in a conference of twenty European countries (see Appendix G).

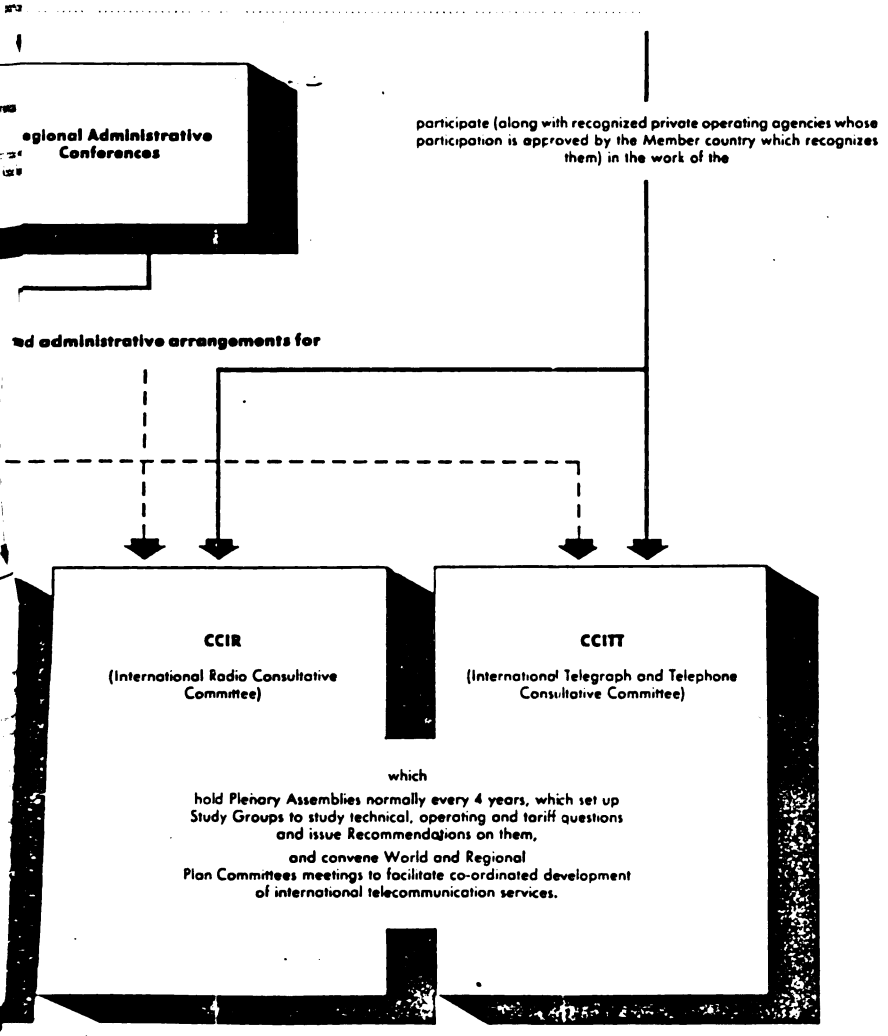
Subsequent to that time there has been tremendous growth in telecommunications of all kinds, in regard to distances spanned, as well as the types of intelligence and

Members of the ITU and the Structure of the Union



Adapted from "INTERNATIONAL TELECOMMUNICATION UNION
WHAT IT IS, WHAT IT DOES, HOW IT WORKS"

Ghana	Jamaica	Malta	Panama	South Africa	United Kingdom
Greece	Japan	Mauritania	Papua New Guinea	Spain	United States
Grenada	Jordan	Mauritius	Paraguay	Sri Lanka	Uruguay
Guatemala	Kenya	Mexico	Peru	Sudan	USSR
Guinea	Kiribati	Monaco	Philippines	Suriname	Vatican
Guinea-Bissau	Korea (Rep. of)	Mongolia	Poland	Swaziland	Venezuela
Guyana	Kuwait	Morocco	Portugal	Sweden	Viet Nam
Haiti	Lao P.D.R.	Mozambique	Qatar	Switzerland	Yemen (A.R.)
Honduras	Lebanon	Namibia	Romania	Syria	Yemen (P.D.R. of)
Hungary	Lesotho	Nauru	Rwanda	Tanzania	Yugoslavia
Iceland	Liberia	Nepal	Saint Vincent and the Grenadines	Thailand	Zaire
India	Libya	Netherlands	San Marino	Togo	Zambia
Indonesia	Liechtenstein	New Zealand	Sao Tome and Principe	Tonga	Zimbabwe
Iran (Islamic Republic of)	Luxembourg	Nicaragua	Saudi Arabia	Trinidad and Tobago	
Iraq	Madagascar	Niger	Senegal	Tunisia	
Ireland	Malawi	Nigeria	Sierra Leone	Turkey	
Israel	Malaysia	Norway	Singapore	Uganda	
Italy	Maldives	Oman	Somalia	Ukraine	
	Mali	Pakistan		United Arab Emirates	*(as at 1 March 1987)*



information which are transmitted. The American, Alexander Graham Bell, invented the telephone in 1876 and soon there was a demand for international telephone calls. Consequently in 1885, the first ITU provisions for international telephony were made in a conference in Berlin. Twenty years later, in 1895, the historic first experiments in radio communication took place, followed by the first International Radio Conference in 1906, in Berlin.[4]

Since 1906, a continuing series of conferences have progressively extended the scope of international communications by wire and by radio, and have provided for many additional telecommunication services such as fixed (point-to-point), mobile (ship-to-shore, air-to-ground, etc), navigational aids to ships and aircraft, national and international broadcasting, television, data transmission, and more recently the introduction of space techniques in radio communication.[5] For a step by step treatment of the history of the ITU, refer to Appendix B of this thesis.

The 1850's had seen rapid development and proliferation of public telegraph correspondence within the national boundaries of all major European countries. However, there was little international telegraphic correspondence. The sight of telegraph wires from two neighboring nations, coming to a common border and there terminating; each on its own side, within its own national boundaries: (this sight) was not uncommon. Obviously, this situation was

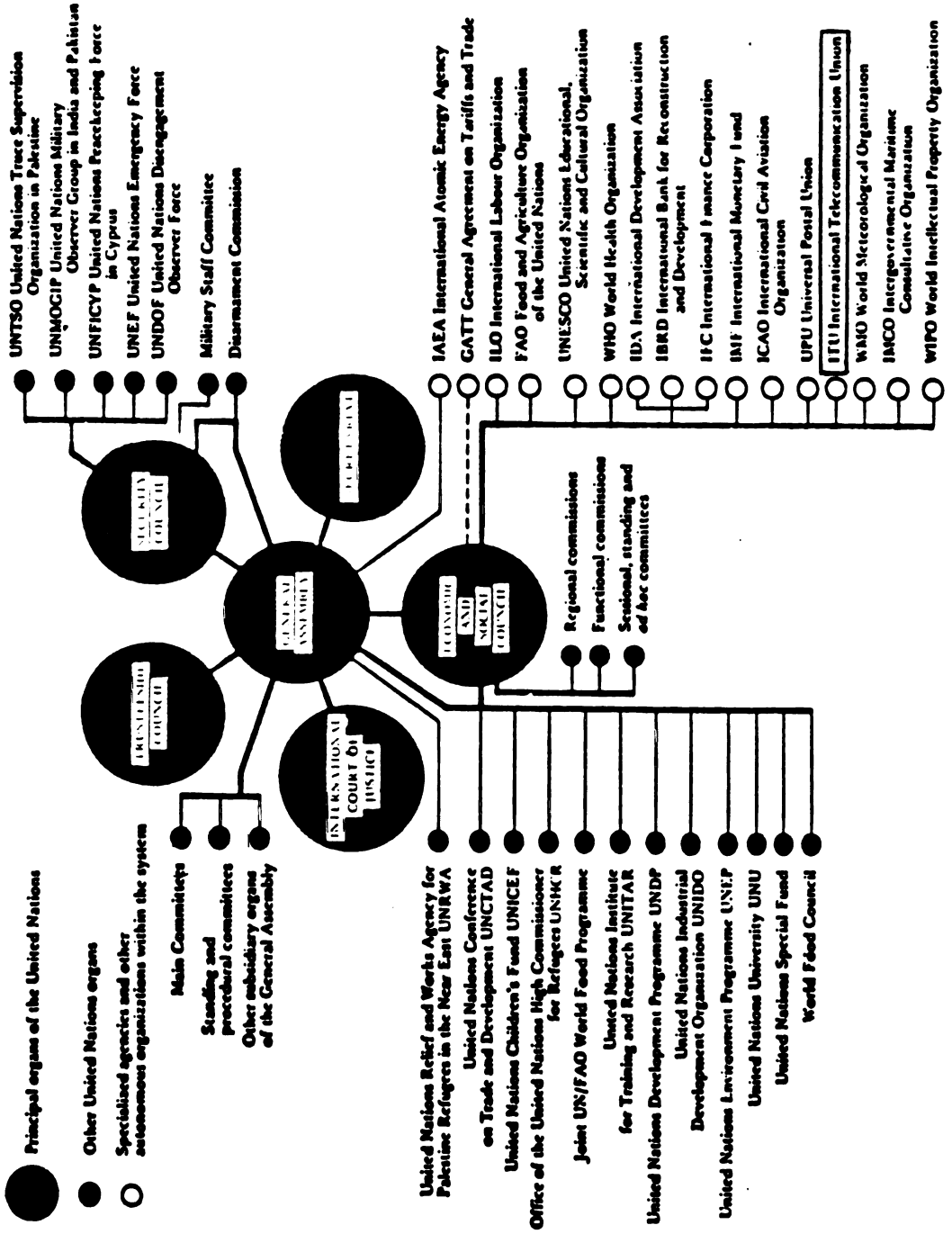
crying out for a remedy. Common international links had to be forged. In order to address this intolerable situation and directly seek a solution; the French Imperial Government, in 1864, sent invitations to all major European countries, proposing the convening of a conference whose main theme would be to hammer out conventions which would provide a uniform international telegraph system. The following year, 1865, saw the birth of an organization whose purpose was to facilitate international cooperation in telecommunications, named the International Telecommunication Union.[6]

Composition and Purpose of the Union

The ITU, one of the most universal international organizations, is currently comprised of 162 members. In 1947 this Union became a specialized agency of the United Nations by an agreement which established its role in the field of telecommunication regulation, recognized under the United Nations umbrella.[7] The ITU which existed before its affiliation with the United Nations (U.N.), is shown in figure 2 in its relation to the U.N. The ITU differs from other specialized agencies of the U.N. partly because its basic structure and policies are laid down in a Convention instead of a Charter. A Convention is easier to change than a Charter.[8]

The purposes of the Union as laid down in Article 4 of

FIGURE 2



Taken from United Nations publication – Sales No. E.75.I.13.

the International Telecommunication Convention (the Convention), signed at Nairobi, on 6 November 1982, are:

> a. to maintain and extend international cooperation between all Members of the Union for the improvement and rational use of telecommunications of all kinds, as well as to promote and to offer technical assistance to developing countries in the field of telecommunications;
>
> b. to promote the development of technical facilities and their most efficient operation with a view to improving the efficiency of telecommunication services, increasing their usefulness and making them, so far as possible, generally available to the public;
>
> c. to harmonize the actions of nations in the attainment of those ends.[9]

Structure and Organization of the Union

The ITU's structure and organization as seen in figure 1; is based on the provisions of the latest version of the International Telecommunication Convention, namely that of Nairobi, 1982.

Membership

Each independent nation can be a member of the ITU. Since the world's first extensive international telecommunication networks were in Europe, the ITU was originally a European body. But soon after de-colonization and national independence the growing number of the so-called "new nations" has increased the present number of member nations of the ITU to 162, of which the majority are from the Third World. The 162 member countries of the Union are

also listed in figure 1.

Article 2 of the Convention 1982, describes the "Rights and Obligations of Members" of the ITU as follows:

> 1. Members of the Union shall have the right and shall be subject to the obligations provided for in the Convention.
>
> 2. Rights of Members in respect of their participation in the conferences, meetings and consultations of the Union are:
>
> a. all Members shall be entitled to participate in conferences of the Union, shall be eligible for election to the Administrative Council and shall have the right to nominate candidates for election to any of the permanent organs of the Union;
>
> b. subject to the provisions of Nos. 117 and 179, each Member shall have one vote at all conferences of the Union, at all meetings of the International Consultative Committees and, if it is a Member of the Administrative Council, at all sessions of that Council;
>
> c. subject to the provisions of Nos. 117[10] and 179,[11] each Member shall also have one vote in all consultations carried out by correspondence.[12]

"One Nation One Vote" Principle

The most controversial right of the ITU members is the "one nation, one vote" principle that was adopted from the United Nations, of which the ITU is a specialized agency. The "one nation, one vote" principle also applies in several other specialized agencies of the United Nations, such as the United Nations Educational Scientific and Cultural Organization(UNESCO), the International Labor Organization (ILO) and the Law of Sea Conference.[13] Despite the wide acceptance of the "one nation, one vote"

principle, it remains controversial within the ITU. Why is this so? The United States and some other developed nations argue that they are greater users and larger investors in telecommunications. They also contribute more money to the ITU than most developing nations.[14] So, they reason, they deserve more voting rights than nations which have not been able to attain their level of growth. Furthermore, such factors as land area and population have been offered as a rationale for more votes.[15]

The power indicated by the numerical majority of the developing nations since de-colonization under the "one nation, one vote" principle; is deceptive. Undoubtedly, these countries realize that if they consistently vote for policies which are contrary to the wishes of the developed world, such course of action, may result in future difficulties. The developed nations have power beyond their actual membership numbers due to their substantial voluntary monetary contributions to the maintenance of the ITU. The developing nations implicitly understand that these voluntary contributions are contingent upon policies that are generally acceptable to the developed nations. During the Plenipotentiary Conference of Nairobi in 1982, the United States offered to increase its training assistance to developing countries, establishing the United States Training Institute. This was done in order to increase support for the United States among the Third World

Countries which had recently cast votes unfavorable to the United States' policies. The level of disagreement between the United States and the Third World was serious enough for the United States to consider withdrawal from the ITU. The United States' Office of Technological Assessment discussed the possibility of establishing "... a more congenial grouping of developed countries as a forum for coordination to avoid radio interference, and simply ignore other countries" (USOTA, 1982: 19).[16] Also, it proposed the modification of the one nation, one vote principle "to give more weight to the developed countries". Furthermore, the OTA discussed the utility of increased regionalization in order to delimit the impact of decisions, to specific geographical areas.[17] To further complicate matters, it must be remembered that among the developing nations themselves, there are differences such as, political alignment, population, land area, level of economic development and technological development. The converse of this is also true. For example, the US and the USSR are often adversaries over many issues. However, on the subject of "one nation, one vote" they agree that the greater users of radio frequencies and investors in telecommunications technology, merit more votes than the technologically less advanced nations.[18] Despite appearances to the contrary, the developing nations find themselves strapped within the constraints of low economic and

technological development. This thesis will help to explain how these phenomena intervene in the application and acquisition of radio frequencies.

Institutions

The organization of the ITU, (Figure 1) and stated in Article 5 of the Convention, is composed of four permanent organs, the General Secretariat, the International Frequency Registration Board (IFRB), the International Radio Consultative Committee (CCIR), and the International Telegraph and Telephone Consultative Committee (CCITT). Additionally, the ITU's functions are fulfilled by three non-permanent organs: the Plenipotentiary Conference, the Administrative Conferences, and the Administrative Council. Although all these institutions each have their own structure and purposes, their work is integrated.

Of the organs just listed, the IFRB is the one crucial to this study. Therefore the IFRB will be described in further detail in the next section.

The International Frequency Registration Board (IFRB)

Origin

In the early years of radio, matters involving the noxious interference of radiowaves emanating in one country and spilling across national borders into another country

(or countries) were negotiated directly between governments and solutions and settlements were sought at that level. The dimensions of this problem of spillover and noxious interference expanded exponentially with the meteoric rise of the use of radio broadcasting and telecommunication. This piece-meal approach to settling the problem of international radio interference soon proved to be woefully inefficient and so other pragmatic ways of arriving at solutions were sought. It was in that spirit that a conference was convened at Atlantic City in 1947. By this time it was clear to all concerned that the best way to, handle these vexing problems arising out of national use of the radio spectrum was to adopt a coordinated, international approach to the use of radio frequencies. Obviously, protocols had to be devised and policies adopted which, embodying the force of International Law; would, to the benefit of all concerned, put an end to the anarchy which had developed in international use of radiowaves. In this fashion, the idea for cooperation and harmony among nations in their peaceful use of the radio spectrum was given incarnation as the IFRB. From the outset therefore, the IFRB was created to handle notification, examination, coordination and registration of frequencies. According to the new philosophy, each national government; 'Administration' in the ITU nomenclature, would notify intended use of a frequency to the IFRB. It is necessary to know that

stations not capable of causing harmful interference to those of another country need not comply with any ITU arrangements (see chapter 3 for frequency assignment procedure).

Structure

The constitution and essential duties of the IFRB are laid down in article 10 and 57 of the International Telecommunication Convention. The IFRB consists of five independent members, elected by the Plenipotentiary Conference.[19] All these members must be technically qualified in the radio field. To ensure equitable distribution amongst the regions of the world, these members are elected carefully from candidates sponsored by countries that are members of the ITU. "The members of the International Frequency Registration Board shall serve, not as representing their respective countries, or of a region, but as custodians of an international public trust."[20]

Duties

The essential duties of the IFRB, exactly as stated in the International Telecommunication Convention are:

> a) to effect an orderly recording and registration of frequency assignments made by the different countries in accordance with the procedure provided for in the Radio Regulations and in accordance with any decision which may be taken by competent conferences of the Union, with a view to ensuring formal international recognition thereof;

b) to effect, in the same conditions and for the same purpose, an orderly recording of the positions assigned by countries to geostationary satellites;

c) to furnish advice to Members with a view to the operation of the maximum practicable number of radio channels in those portions of the spectrum where harmful interference may occur, and with a view to the equitable, effective and economical use of the geostationary satellite orbit, taking into account the needs of Members requiring assistance, the specific needs of developing countries, as well as the special geographical situation of particular countries;

d) to perform any additional duties, concerned with the assignment and utilization of frequencies and with the equitable utilization of the geostationary satellite orbit, in accordance with the procedures provided for in the Radio Regulations, and as prescribed by a competent conference of the Union, or by the Administrative Council with the consent of a majority of the Members of the Union, in preparation for or in pursuance of the decisions of such a conference;

e) to provide technical assistance in making preparations for and organizing radio conferences in consultation, as appropriate, with the other permanent organs of the Union, and with due regard for the relevant directives of the Administrative Council in carrying out these preparations; the Board shall also provide assistance to the developing countries in their preparations for these conferences;

f) to maintain such essential records as may be related to the performance of its duties.[21]

Basically, the IFRB's duties were assigned to two major areas at the 1947 Atlantic City Conference. These areas are:

It was given the power to study problems dealing with international frequency management when so requested by administrations and it was given the power to cancel frequency assignments that were not placed into operation within two years following the date of receipt of the first notice, or that had been out of use for a period of three years, but only if it obtained the agreement of the administration which

had notified them.[22] (see also chapter 3, pp. 37-44).

It should also be noted that if an Administration decides to use or continues using a frequency that the IFRB has found in conflict with its policies for the use of frequencies there is nothing that the IFRB can do. The IFRB was not given any power whatsoever to make a determination on the legal merits of disputes which may occur over harmful interference cases. If called upon by an Administration, the IFRB could assist the disputants to come to a mutual arrangement. To this extent the IFRB is to help and suggest, but not to decide.[23]

In succeeding chapters we will see how the IFRB executes the primary tasks relating to the notification, examination, coordination and registration of frequency assignments. We will also see how these internationally recognized radio frequencies are distributed among the ITU Members and how these frequencies are related to the aforementioned variables: globally, regionally and in Region 2, country-by-country.

Notes Chapter 2

1. Doc. SEM IFRB 1/86-E, p. 1.

2. The basic regulations of the ITU are laid down in the International Telecommunication Convention of Nairobi, 1982 and the Radio Regulations 1986, part 1 and 2.

3. Doc. SEM IFRB 1/86-E, p. 1.

4. Ibid.

5. Ibid.

6. Jean-Luc Renaud, The Changing Dynamics of the International Telecommunication Union: An Historical Analysis of Development Assistance. Dissertation for the Degree of Ph. D. Michigan State University, 1986, p. 37.

7. Doc. SEM IFRB 1/86-E, p. 2.

8. Renaud, p. 330, "Note about Convention and Charter".

9. International Telecommunication Union, International Telecommunication Convention of Nairobi (Geneva: General Secretariat, 1982), Art. 4, p. 3.

10. Ibid, Art. 15, no. 117, p. 16.

A Member which is in arrear in its payments to the Union shall lose the right to vote as defined in Nos. 10 and 11 for so long as the amount of its arrears equals or exceeds the amount of the contribution due from it for the preceding two years.

11. Ibid, Art. 45, no. 179, p. 29.

From the end of a period of two years from the date of entry into force of this Convention, a signatory government which has not deposited an instrument of ratification in accordance with No. 177 shall not be entitled to vote at any conference of the Union, or at any session of the Administrative Council, or at any meeting of any of the permanent organs of the Union, or during consultation by correspondence conducted in accordance with the provisions of the Convention until it has so deposited such an instrument. Its rights, other than voting rights, shall not be affected.

12. Ibid, Art. 2, p. 2.

13. Congress of the United States, Radiofrequency Use and Management. Impacts from the World Administrative Radio Conference of 1979 (Washington D.C.: Office of Technological Assessment, 1982), p. 117.

14. George A. Codding, Jr and Anthony M. Rutkowski, The International Telecommunication Union in a Changing World (Washington St.: ARTECH HOUSE, INC., 1982), pp. 186-187.

15. Congress of the United States, p. 117.

16. Sydney Head, World Broadcasting. A Comparative Analysis. (Belmont: Wadsworth Publishing Company, 1985), p. 140.

17. Ibid.

18. Congress of the United States, p. 117.

19. International Telecommunication Convention of Nairobi, Art. 10, pp. 9-10.

20. Ibid.

21. Ibid.

22. Codding, p. 120.

23. Ibid, 119.

Chapter 3

FREQUENCY ASSIGNMENTS AND FREQUENCY DISTRIBUTION GLOBALLY AND REGIONALLY

Internationally Recognized Frequencies

This chapter examines information gathered from the Master International Frequency Register(MTFR) of the ITU's Headquarters. The MIFR is a file in which the IFRB lists frequencies which will be assigned by its Administrations to stations in countries which have submitted notification. I must note here that the MIFR does not contain a complete listing of all the frequencies in use in any particular country. Mainly internationally recognized frequencies are listed in the MIFR. Consequently, only the number of frequencies with international recognition are used in this study.

The following procedure will shed light on which frequencies are notified to the IFRB, and which the IFRB registered in the MIFR with the right to enjoy international recognition.

Procedures for the International Coordination, Notification and Recording of Frequency Assignments

First, according to the provisions of the Radio Regulations, any intended use of a frequency, by an Administration (with certain specific exceptions) shall be notified

to the IFRB, together with its technical characteristics;

> a. "if the use of the frequency concerned is capable of causing harmful interference to any service of another administration;
>
> c. if the frequency is to be used for international radio communication; or
>
> d. if it is desired to obtain international recognition of the use of the frequencies."[1]

Second, the IFRB will examine the notice for the following:

> a. its conformity with the Convention, the Radio Regulations and other pertinent Agreements and Arrangements
>
> b. its probability of causing harmful interference to an assignment already recorded and enjoying international recognition.[2]

Third, the favorable findings, ie. those notifications which are in conformity with the Regulations and will not cause harmful interference; these would result in the recording of the frequency in the MIFR, with the right to international recognition. If the findings are unfavorable, that is to say, not in conformity with the Regulations or can cause harmful interference to an assignment already recorded and enjoying international recognition; the IFRB will return the notice to the Administration for reconsideration and search for a solution.[3]

The first rule, conformity with the applicable international Law, was proposed by the United States and provides a basic precept for the IFRB's frequency assignment policy. It simply states that any requested frequency adheres to

the various procedures stated by the IFRB. This rule has been relatively uncontroversial because the Administrations understand that consistent guidelines for frequency assignments are necessary for harmonious relationships between the various members of the ITU. Also the IFRB helps those nations that need assistance in avoiding infractions of the regulatory procedures stated in the Convention and the Radio Regulations. As stated in chapter 2, if an Administration insists on using a frequency that the IFRB finds against the applicable regulations, there is nothing the IFRB can do, as it was given no power of enforcement.

The second rule, 'Earlier use and notification to the IFRB', is one of the most controversial issue concerning international telecommunications debated both within and outside the ITU for more than 40 years. According to Codding (1982), frequency management issues have always been the most controversial topic among ITU Members since the Atlantic City Radio Conference of 1947.[4] This rule can be applied if after the technical examination, the IFRB finds that there is a probability of the requested frequency causing harmful interference to an assignment already recorded and enjoying international recognition. According to an interview with members of the IFRB, this rule is never immediately applied after the first technical examination. One of the main tasks of the IFRB in this process is the coordination of unfavorable cases. When such

cases arise the IFRB seeks to help the Administrations find other frequencies, or else, facilitates contact with the country whose frequency might suffer harmful interference. If the efforts of the IFRB result in an impasse, the request of the country seeking a new frequency assignment must yield to the nation which already has a frequency with international recognition. Therefore the 'Earlier use and notification to the IFRB' rule is only used as a last resort. However, it is probably in the context just described that this rule came to be called the "first come, first served" rule.

ITU Policies Guiding Frequency Assignments

The principle of first-come, first-served; presented relatively few problems in the period after the invention of radio, until World War 2. The post-War era saw the emergence of many new nations out of the former European colonies. These new nations, generally speaking, immediately joined the ITU upon gaining independence.

The ITU found itself confronting a situation that it had not been designed to handle. It should be borne in mind that the ITU was created to meet the needs of twenty European countries (Appendix G). The problems that the newly independent nations encountered in the ITU are amply illustrated by Scantlebury's following statement:

> "It was this system that the new states encountered when they became independent in the 1950's and

> 1960's. It had its primary focus on the maintenance and improvement of an already establish international telecommunications network. The system and the ITU were dominated by the major Western trading nations, and it functioned mainly to meet their requirements and perceived needs".[5]

Consequently, in the first hundred years of the ITU, only one major elected official of the ITU was not a citizen of Western Europe or the United States. That individual was Marco Aurelio Andrada of Argentina, the Secretary General from 1954 tO 1958.[6,7]

The new members of the ITU found themselves with domestic situations markedly different from those of the older members of the ITU. In short, the new nations, generally, had poorly developed international communication systems, their regional communication networks were virtually non-existent and their international linkages consisted mainly of connections to the former metropolitan powers.

Responding to the demands of the new members of the ITU, who now constituted a majority, the ITU implemented its own development fund. Some developed member nations of the ITU willingly contributed thousands of dollars, in addition to providing invaluable technical expertise, to this special developmental fund of the ITU.[8,9] The ITU technical assistance program was able to bring about significant improvements in the telecommunication systems of many of its new members.

Despite its achievements, the development program of

the ITU was not without its drawbacks. New problems surfaced, noticeably in the area of frequency assignments. Apparently, the same process which brought the development of communication networks in the new nations, also served to increase their need for more frequencies. The acquisition of frequencies has been complicated by the fact that one of the ITU's basic principles is "first come, first served". In essence the ITU had to deal with the fact that countries already had control of certain frequencies. Since the ITU had no way of forcing countries to give up their frequencies, the ITU simply settled on the principle of recognizing the first country to control the frequency as it rightful owner. In doing this the ITU was able to maintain its authority as a legitimating body without alienating powerful member states. This situation translated itself into the "first come first served" principle.

The "first come, first served" principle of the ITU has, arguably been an inappropriate and inequitable basis of distributing the radio spectrum. Masmoudi (1984), points out that the first-come, first-served principle contributes in a major fashion to the disparity in frequency assignment which exists between the First World and the Third World.[10]

Another policy that is said to inhibit the number of frequencies available to the Third World is the policy concerning "Modification, Cancellation and Review of Entries in the Master Register".

> Whenever it appears to the Board(IFRB) from the information available that a recorded assignment has not been brought into regular operation in accordance with those basic characteristics, the the Board shall consult the notifying administration and, subject to its agreement, (underlining added) shall either cancel, or suitably modify, or retain the basic characteristics of the entry.[11]

The Third World Countries make critical reference to the practice, often indulged in by the rich technologically advanced First World Countries, of hoarding frequencies acquired by means of the "first come, first served" device which are then held for years unused. The developing nations complain quite strongly that these hoarded frequencies further diminish their access to the availability of additional frequencies to serve their present and future needs.

However, in 1974 the IFRB designed a procedure "... to determine which frequency assignments to international links in the Fixed service recorded in the Master Register (M.A.) no longer reflected actual usage of the radio spectrum in the 3 to 30 MHz range, with a view to making the necessary changes or cancellations ..." Thanks to the cooperation of administrations, the following changes have been made between 1977 and 1979.

TABLE 1

Frequencies not Reflecting Actual Usage

Year	Entries Subject to this Inquiry	Entries Cancel-led	Entries Marked Used Occasion-ally	Entries Maintained Unchanged
1977	7896	5613	1481	802
	100%	71.08%	18.76%	10.16%
1978	1271	491	447	333
	100%	38.6%	35.2%	26.2%
1979	1204	635	154	415
	100%	52.7%	12.8%	34.5%

Compiled from the Reports on the Activities of the ITU 1977, 1978 and 1979.[12]

Further research is needed to know if the ITU has continued to apply this procedure since 1979. Also, a study of the proportion of frequencies falling under the above described inquiry, would undoubtedly prove to be of great value to students of telecommunications as well as of the nations of the world.

It is important to note that the IFRB was able to only change the status of frequencies in those instances were national administrations were amenable to cooperation. Obviously, this fact served to constrain the IFRB's ability to alter any under-utilized frequency. The IFRB's limited ability to change existing irregularities, stems from its lack of coercive power.

As if to further confound the situation, the ITU

promulgated Conventions which encouraged Administrations to adopt high levels of communications technology in order to obtain the frequencies they need. Exactly, as stated in Article 33 of Convention Nairobi, 1982:

> Rationale Use of the Radio Frequency Spectrum and of the Geostationary Satellite Orbit
>
> 1. Members shall endeavour to limit the number of frequencies and the spectrum space used to the minimum essential to provide in a satisfactory manner the necessary services. To that end they shall endeavour to apply the latest technical advances as soon as possible.
>
> 2. In using frequency bands for space radio services Members shall bear in mind that radio frequencies and the geostationary satellite orbit are limited natural resources and that they must be used efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to both, taking into account the special needs of the developing countries and the geographical situation of particular countries.[13]

The expenses involved in acquiring, installing, operating and maintaining high technology telecommunication systems, are prohibitively beyond the national needs or economic capabilities of many newly independent countries. These constraints, did not apply to older, richer, technologically-developed nations. So, here we see the discriminatory nature of the "first come, first served" principle in operation. Due to historical, economic, technological and political reasons, the newer ITU members find themselves at a disadvantage, because countries already well

established, for example as international broadcasters and employing high powered transmitters have an advantage over newcomers to the scene. From the prospective of these newer nations therefore, the first-come, first-served principle seems unfair. It appears to legitimize an existing situation, which was already exclusionary of the newer countries.

Essentially, the great economic advantages of the industrialized nations allowed them to exploit technology at a pace that is not even remotely feasible for the vast majority of the new ITU members. The consequence of this situation was that these advanced industrialized powers were able to acquire large numbers of frequencies for a wide variety of purposes, such as communications, military and surveillance uses. World Superpowers such as the United States and the USSR are the primary users of frequencies . Table 2 shows the number of frequencies that are being used by the 20 largest frequency users.

In his study of spectrum management, Porat (1980) estimated that the United States and the USSR, having only 15 percent of the world's population, use 50 percent of the spectrum.[14] Our research indicates that these two nations have 255691 frequency assignments, that is approximately 25 percent of the total number of frequencies with international recognition around the world.

In conclusion, there are two mechanisms responsible for

the lower numbers of frequencies assigned to Third World Countries: An historical disadvantage, their date of decolonization, and a present day disadvantage: their inability to propose the latest technological applications.

TABLE 2

The Top Twenty Frequency Users

1.	United States	209199	20.8%
2.	Argentina	100533	10.0%
3.	Canada	53855	5.4%
4.	France	51564	5.0%
5.	United Kingdom	51350	5.1%
6.	German Fed. Rep. of	50617	5.0%
7.	The USSR	46392	4.6%
8.	Mexico	38509	3.8%
9.	Brazil	32975	3.3%
10.	German Dem. Rep. of	30268	3.0%
11.	Australia	24200	2.4%
12.	China	22977	2.3%
13.	Austria	18244	1.8%
14.	India	16810	1.7%
15.	Denmark	15656	1.6%
16.	Japan	14994	1.4%
17.	Indonesia	14379	1.4%
18.	Norway	14197	1.4%
19.	New Zealand	14124	1.4%
20.	Uruguay	11116	1.1%
	total(N=20)	966909	96.3%
	the rest(N=148)	37029	3.7%
	Total	1003938	100%

Compiled from the Total Number of Frequency Assignments ted by Administration, per September 24, 1987 (see Appendix E).

Overview of Worldwide Distribution

The following prima facie disparity of the assigned frequencies worldwide shows that the MIFR lists 1003938 frequencies with international recognition. Appendix E is a copy of the information received from the ITU, from which Table 3 is compiled. The countries are arranged in descending order according to the number of frequencies assigned to each.

An idea of the differences in assigned frequencies can be gained by examining the number of frequencies assigned to:

- The World Superpowers: the United States with 209199 and the USSR with 46392 frequencies.
- The Federal Republic of Germany with 51350 and the Democratic Republic of Germany with 38509 frequencies.
- Argentina with 100533, Brazil with 32975 and Mexico with 38509 frequencies.
- India with 16810 and China with 22977 frequencies.
- Panama with 4745 and Nicaragua with 297 frequencies.
- Cuba with 4015, Jamaica with 137 and the Dominican Republic with 492 frequencies.
- Nigeria with 1668 and South Africa with 3307 frequencies.
- The Republic of Korea with 2188 and the Democratic Republic of Korea with 50 frequencies.
- Suriname with 402 and Guyana with 223 frequencies.

. Haiti with 48 and Comoros with 55 frequencies.

This varied list of countries provides an opportunity to view the great differences in frequency assignments among ITU members. The relationships and variations between frequency assignments and selected characteristics will be analyzed through Pearsons Product-Moment Correlation and Multiple Regression Analysis in chapters four and five. The analyses will be applied on a country-by-country basis to Region 2 in chapter 6.

TABLE 3

ITU Members in Descending Order of the Number of Frequencies Assigned to Each

1.	United States	209199	48.	Greece	1837
2.	Argentina	100533	49.	Peru	1769
3.	Canada	53855	50.	Vietnam	1736
4.	France	51564	51.	Nigeria	1668
5.	United Kingdom	51350	52.	Burma	1663
6.	German Fed. Rep. of	50617	53.	P. New Guinea.	1608
7.	USSR	46392	54.	Madagascar	1558
8.	Mexico	38509	55.	Thailand	1541
9.	Brazil	32975	56.	Jordan	1484
10.	German Dem. Rep. of	30268	57	Venezuela	1447
11.	Australia	24200	58.	Mongolia	1315
12.	China	22977	59.	Morocco	1354
13.	Austria	18244	60.	Ireland	1264
14.	India	16810	61.	Bahrain	1242
15.	Denmark	15656	62.	Rumania	1234
16.	Japan	14994	63.	Ivory Coast	1228
17.	Indonesia	14379	64.	Congo	1148
18.	Norway	14197	65.	Oman	1119
19.	New Zealand	14124	66.	Malaysia	1093
20.	Uruguay	11116	67.	Ethiopia	1065
21.	Italy	10427	68.	Chad	1036
22.	Spain	8575	69.	Guatemala	979
23.	Chile	8247	70.	Ghana	975
24.	Saudi Arabia	8167	71.	Mauritania	913
25.	Sweden	7800	72.	Senegal	899
26.	Pakistan	6411	73.	Singapore	877
27.	Yugoslavia	5141	74.	Iraq	868
28.	Panama	4745	75.	Israel	863
29.	Finland	4313	76.	Angola	862
30.	Cuba	4015	77.	Ecuador	845
31.	Netherlands	3804	78.	Egypt	792
32.	Turkey	3633	79.	Tanzania	783
33.	Poland	3377	80.	Zimbabwe	768
34.	South Africa	3307	81.	Iceland	742
35.	Columbia	3274	82.	Libyan	719
36.	Philippines	3198	83.	Cameroon	712
37.	Bolivia	3176	84.	Kenya	712
38.	Czechoslovakia	3114	85.	Tunisia	698
39.	Switzerland	2809	86.	Qatar	666
40.	Iran	2501	87.	Bulgaria	622
41.	Portugal	2191	88.	Hungary	602
42.	Korea Rep.	2188	89.	Sudan	592
43.	Bangladesh	2093	90.	Gabon	582
44.	Algeria	2006	91.	Paraguay	579
45.	Zaire	1897	92.	Malta	566
46.	Mozambique	1880	93.	Zambia	513
47.	Belgium	1850	94.	Cape Verde	512

TABLE 3(CONT'D.)

95.	Dominican Rep.	492	143.	Barbados	88
96.	Honduras	468	144.	Seychelles	88
97.	Sri Lanka	465	145.	Solomon Islands	84
98.	El Salvador	462	146.	Eq. Guinea	82
99.	Mali	451	147.	Trin. & Tab.	80
100.	Central Af. Rep.	418	148.	Luxembourg	78
101.	United Arab Em.	413	149.	The Gambia	78
102.	Fiji	404	150.	Costa Rica	72
103.	Somalia	403	151.	Tonga	64
104.	Suriname	402	152.	Comoros	55
105.	Cyprus	400	153.	Maldives	50
106.	Uganda	352	154.	Korea P.D.R.	50
107.	Niger	351	155.	Haiti	48
108.	Kuwait	342	156.	Antigua & Bar.	45
109.	Afghanistan	315	157.	St.Vin. & Gren.	43
110.	Sierra Leone	312	158.	St. Lucia	42
111.	Burkina Faso	306	159.	Vatican City St.	39
112.	Lebanon	301	160.	Naura	38
113.	Nicaragua	297	161.	St. Chr. & Nevis	37
114.	Liberia	283	162.	Grenada	32
115.	Yemen P.D.R.	251	163.	San Marino	32
116.	Botswana	245	164.	Dominica	31
117.	Syrian Arab Rep.	235	165.	Brunei	31
118.	Guyana	223	166.	Brunei War	31
119.	Yemen Arab. Rep.	217	167.	Bermuda	11
120.	Guinea-Bisau	214	168.	Anguilla	1
121.	Kiribati	200			
122.	Guinea	187			
123.	Bahamas	186		Total	1003938
124.	Togo	186			
125.	Djibouti	185			
126.	Benin	154			
127.	Albania	150			
128.	Mauritius	145			
129.	Lesotho	141			
130.	Rwanda	138			
131.	Jamaica	137			
132.	Malawi	121			
133.	Kampuchea	119			
134.	Monaco	117			
135.	Tuvalu	116			
136.	Burundi	116			
137.	Sao Tome & Principe	114			
138.	Vanauta	113			
139.	Swaziland	110			
140.	Belize	109			
141.	Lao P.D.R.	104			
142.	Nepal	97			

The ITU consists of 162 members. The N in this study is 168 because 6 territories controlled by their ex-colonizers are registered under their own country name.

Inter-Region Comparison

This section provides a brief inter- and intra-region comparison of the number of frequencies assigned to, different countries by the ITU. The ITU classifies its 162 member nations into three Regions. Region 1 consists of Europe, the USSR and Africa. Region 2 is the Americas and some Atlantic and Pacific Islands. Region 3 is comprised of Asia and the South Pacific. All of the countries which comprise the three Regions are listed in the Tables 5, 6 and 7, in descending order according to the number of frequencies assigned to each. To illustrate the differences in the frequencies assigned to ITU Member nations more clearly, the countries are set out per region in histograms (Figures 3, 4 and 5). To compile these histograms, the number of frequencies, per Administration, were divided by 1000.

It is of interest to note that there exists a marked difference in the number of countries comprising both Region 2 and Region 3, as compared to the number of countries contained in Region 1. Region 1 consists of 83 countries. Region 2, 37 countries and Region 3; 48 countries. The spectrum space shortage in Region 1 as compared to Region 2 is largely due to the density of countries in a small geographic area. In the words of Head:

> "The 27 countries of Western-Europe constitute the most densely covered broadcasting area of the world, with only 6 percent of the worlds population but 19

percent of its broadcast receivers, all crowded into only about 3 percent of the land area".[15]

Despite the discrete allocation of each country to one individual Region, we have seen instances in which countries belonging to a particular region hold frequencies in at least one other region. These seven countries are represented in at least one other region:

TABLE 4

Cross-region Frequency Assignments

Countries	Region 2	Region 1	Region 3
United States	209199	----------10526----------	
United Kingdom	488	51350	
France	2288	51564	
Denmark	667	15656	
Netherlands	319	3804	
Sweden	8	7800	
Peru	1769	1	

Compiled from the total number of frequency assignments, listed by Administration, per September 24, 1987 (see Appendix E).

The IFRB rationale which helps us to make sense of these apparent anomalies was furnished by Mr. J. Balfroid, Head of the Registration and Publications Divisions and Operation Division of the IFRB. Mr. Balfroid explained that territorial and diplomatic reasons lie behind these cross-region assignments. Partly, this rationale makes sense, because most of these countries still have territories

in other regions than the one in which they are located. In other words, the frequencies of those territories (for example colonies) are registered under the name of the metropolitan governments. Upon initial examination, it seems odd that only these seven countries have cross-regional frequency assignments for diplomatic and territorial purposes. Further research is needed to explore the range of factors and applications of frequency assignments that explain their use in multiple regions by ex-colonizers and present day superpowers.

The roots of strong American representation in Region 3 can be traced back to the acquisition of the Hawaiian Islands in the 1880's as well at that of the Philippines in 1898 as an outcome of the Spanish American War. This is in congruence with the official IFRB explanation of cross- or multi-region frequency ownership based on territorial and diplomatic grounds. The historical process of the United States frequency acquisition behavior overtime, and its use of these frequencies is a topic that we recommend for future research.

Overview of Distribution in Region 1

The USSR the largest member country in geographical area, in Region 1, ranks fourth on the list of frequency assignments (Table 5) France, the United Kingdom and Northern Ireland, and West Germany, all smaller Western

European nations; rank ahead of the USSR in number of frequencies assigned to each. A number of smaller European nations follow the USSR. European nations, as well as the USSR rank among the twenty nations with the greatest number of frequency assignments.

In addition to Europe and the USSR, Region 1 contains the continent of Africa. The number of frequency assignments in Africa presents a stark contrast to the situation in Europe. Most African states have less than 1000 frequencies each assigned to them. In fact 34 African countries have less than 1000 frequencies each. This range extends from Ghana with 975 to the Republic of the Gambia which has a mere 78.

A notable exception to the pattern of frequency assignment in Africa is South Africa. The high number of frequencies assigned to South Africa is probably attributable to its high level of technical and economic development. The association between these factors and the number of frequencies assigned will be investigated more thoroughly in the next chapters.

TABLE 5

Region 1 ITU Members in Descending Order of the Number of Frequencies Assigned to Each

1.	France	51564	46.	Bulgaria	00622
2.	United Kingdom	51350	47.	Hungary	00602
3.	Germany Fed. Rep. of	50617	48.	Sudan	00592
4.	USSR	46392	49.	Gabon	00582
5.	German Dem. Rep. of	30268	50.	Malta	00566
6.	Austria	18244	51.	Zambia	00513
7.	Denmark	15656	52.	Cape Verde	00512
8.	Norway	14197	53.	Mali	00451
9.	Italy	10427	54.	Centr.Af.Rep.	00418
10.	Spain	08575	55.	Somalia	00403
11.	Sweden	07800	56.	Uganda	00352
12.	Yugoslavia	05141	57.	Niger	00351
13.	Finland	04313	58.	Sierra Leone	00312
14.	Netherlands	03804	59.	Burkina Faso	00306
15.	Turkey	03633	60.	Botswana	00245
16.	Poland	03377	61.	Guinea-Bissau	00214
17.	South Africa	03307	62.	Guinea	00187
18.	Czechoslovakia	03114	63.	Togo	00186
19.	Switzerland	02809	64.	Djibouti	00185
20.	Portugal	02191	65.	Albania	00150
21.	Algeria	02006	66.	Benin	00154
22.	Zaire	01897	67.	Mauritius	00145
23.	Mozambique	01880	68.	Lesotho	00141
24.	Belgium	01850	69.	Rwanda	00138
25.	Greece	01837	70.	Malawi	00121
26.	Nigeria	01668	71.	Monaco	00117
27.	Madagascar	01558	72.	Burundi	00116
28.	Morocco	01354	73.	S. Tome & Pr.	00114
29.	Ireland	01264	74.	Swaziland	00110
30.	Rumania	01234	75.	Lao P.D. Rep.	00104
31.	Ivory Coast	01228	76.	Seychelles	00088
32.	Congo	01148	77.	Eq. Guinea	00082
33.	Ethiopia	01065	78.	Gambia	00078
34.	Chad	01036	79.	Luxembourg	00078
35.	Ghana	00975	80.	Comoros	00055
36.	Mauritania	00913	81.	San Marino	00032
37.	Senegal	00899	82.	Brunei War	00031
38.	Egypt	00792	83.	Vat. City St.	00030
39.	Tanzania	00783			
40.	Zimbabwe	00768			
41.	Iceland	00742		Total	374150
42.	Libya	00719			
43.	Cameroon	00712			
44.	Kenya	00712			
45.	Tunisia	00698			

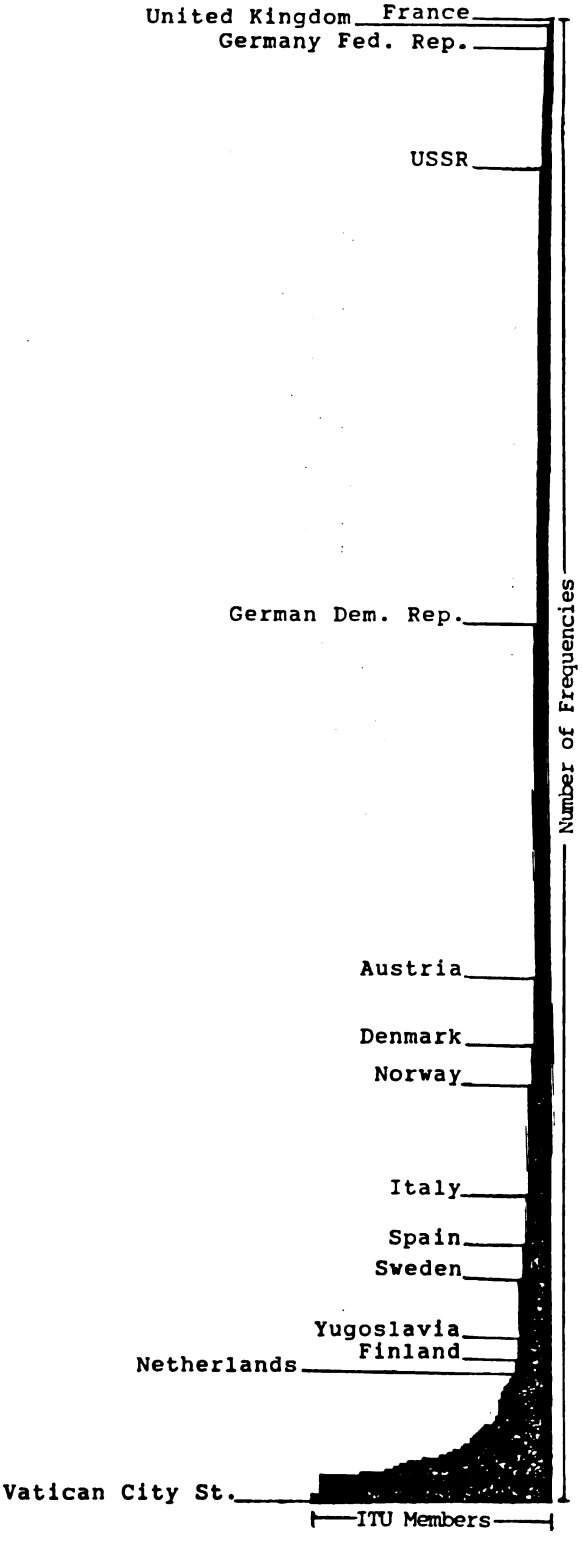


FIGURE 3 : Histogram of Number of Frequencies Assigned to ITU Members in Region 1 up to September, 1987
(This histogram was reduced from its original size)

Overview of Distribution in Region 2

The five largest countries in Region 2 have the greatest numbers of frequencies assigned to them. In descending order, according to the number of frequency assignments, the countries are: the United States, Argentina, Canada, Mexico and Brazil (Table 6). However, in descending order, according to their geographical area they are: Canada, the United States, Brazil, Argentina and Mexico. It seems like their may be a strong relationship between the size of a country and the number of frequencies assigned to each.

Further analysis shows that;

1. Most smaller developing nations in this region have less than 1000 frequencies to work with.
2. Among the top five nations with the largest number of frequencies are two industrialized and three newly-industrialized developing nations.
3. In Region 2, the United States dominates with 209199 frequencies of a total of 478569
4. Argentina with 100533 frequencies, has roughly twice as many frequencies as Canada which has 53855.
5. Mexico has the highest number of frequencies among the Central American countries.
6. Brazil has the most frequencies in South America.
7. Cuba has the most frequencies in the Caribbean.
8. Eight smaller Caribbean territories trail behind Haiti, which itself has 48 frequencies.

TABLE 6

Region 2 ITU Members in Descending Order of the Number of Frequencies assigned to Each

1.	United States	209199
2.	Argentina	100533
3.	Canada	053855
4.	Mexico	038509
5.	Brazil	032975
6.	Uruguay	011116
7.	Chile	008247
8.	Panama	004745
9.	Cuba	004015
10.	Colombia	003274
11.	Bolivia	003176
12.	Peru	001769
13.	Venezuela	001447
14.	Guatemala	000979
15.	Ecuador	000845
16.	Paraguay	000579
17.	Dominican Republic	000492
18.	Honduras	000468
19.	El Salvador	000462
20.	Suriname	000402
21.	Nicaragua	000297
22.	Guyana	000223
23.	Bahamas	000186
24.	Jamaica	000137
25.	Belize	000109
26.	Barbados	000088
27.	Trin. & Tob.	000080
28.	Costa Rica	000072
29.	Haiti	000048
30.	Antigua & Barbuda	000045
31.	St.Vinc.& Gren.	000043
32.	St.Lucia	000042
33.	St.Chris & Nevis	000037
34.	Grenada	000032
35.	Dominica	000031
36.	Bermuda	000011
37.	Anguilla	000001
	Total	478569

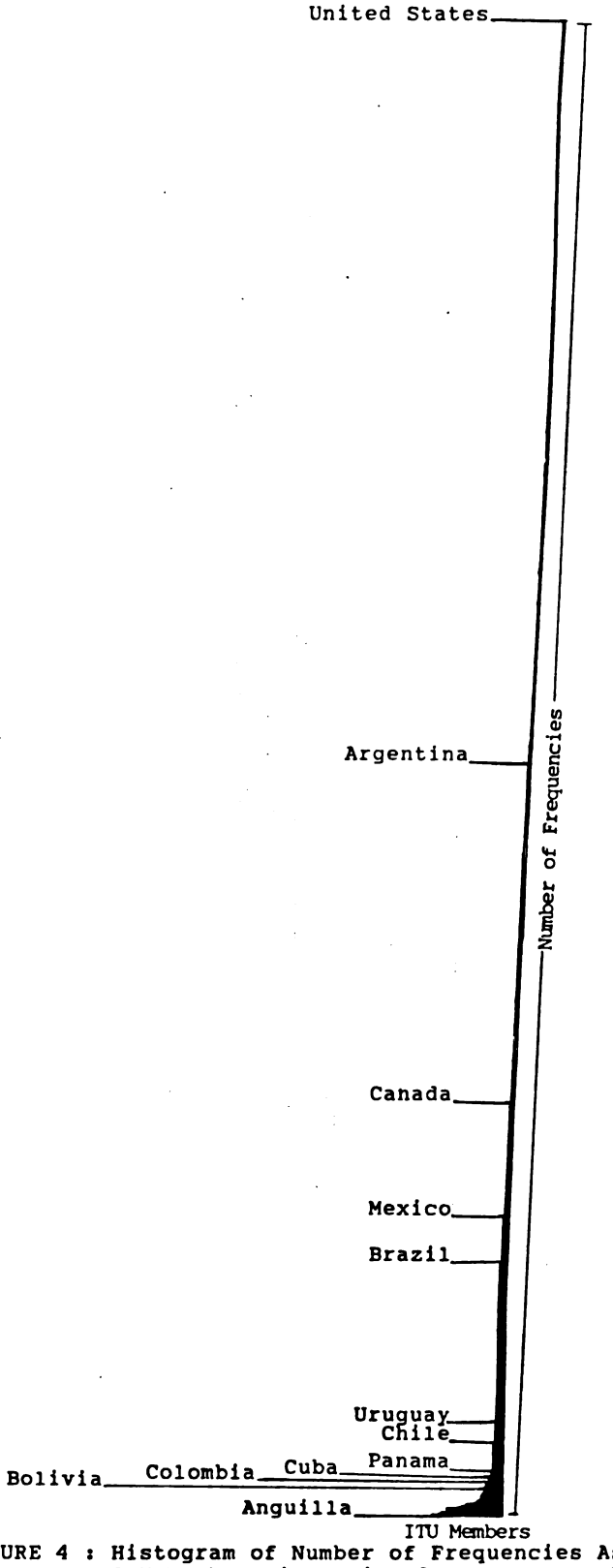


FIGURE 4 : Histogram of Number of Frequencies Assigned to ITU Members in Region 2 up to September, 1987
(This histogram was reduced from its original size)

Overview of Distribution in Region 3

Also in Region 3, the largest countries have the greatest number of frequencies. In descending order of the number of assigned frequencies these nations are: Australia, China and Japan (Table 7).

Region 3 is comprised of 48 countries. Ranging in size from China, India and Australia to Kuwait, Tonga and the Maldives.

Furthermore:

1. Most of the smaller, developing nations in this Region have less than 1000 frequencies to work with.
2. The largest developed and newly industrialized nations use from 14 to 24 times more frequencies than the developing nations.
3. The People's Republic of China ranks second on the list of greatest frequency users.

TABLE 7

Region 3 ITU Members in Descending Order of the Number of Frequencies assigned to Each

1.	Australia	24200	45.	Maldives	00050
2.	China	22977	46.	Korea P.D.R.	00050
3.	India	16810	47.	Naura	00038
4.	Japan	14994	48.	Brunei War	00031
5.	Indonesia	14397			
6.	New Zealand	14124		Total	151219
7.	Saudi Arabia	08167			
8.	Pakistan	06411			
9.	Philippines	03198			
10.	Iran	02501			
11.	Korea Rep. of	02188			
12.	Bangladesh	02093			
13.	Vietnam	01736			
14.	Burma	01663			
15.	Papua New Guinea	01608			
16.	Thailand	01541			
17.	Jordan	01484			
18.	Mongolia	01315			
19.	Bahrain	01242			
20.	Oman	01119			
21.	Malaysia	01093			
22.	Singapore	00877			
23.	Iraq	00868			
24.	Israel	00863			
25.	Angola	00862			
26.	Qatar	00666			
27.	Sri Lanka	00465			
28.	United Arab Emirates	00413			
29.	Fiji	00404			
30.	Cyprus	00400			
31.	Kuwait	00342			
32.	Afghanistan	00315			
33.	Lebanon	00301			
34.	Yemen P.D.R	00251			
35.	Syrian Arab Rep.	00235			
36.	Yemen Arab Rep.	00217			
37.	Kiribati	00200			
38.	Dem. Kampuchea	00119			
39.	Tuvalu	00116			
40.	Vanuata	00113			
41.	Lao P.Dem.Republic	00104			
42.	Nepal	00097			
43.	Solomon Islands	00084			
44.	Tonga	00064			

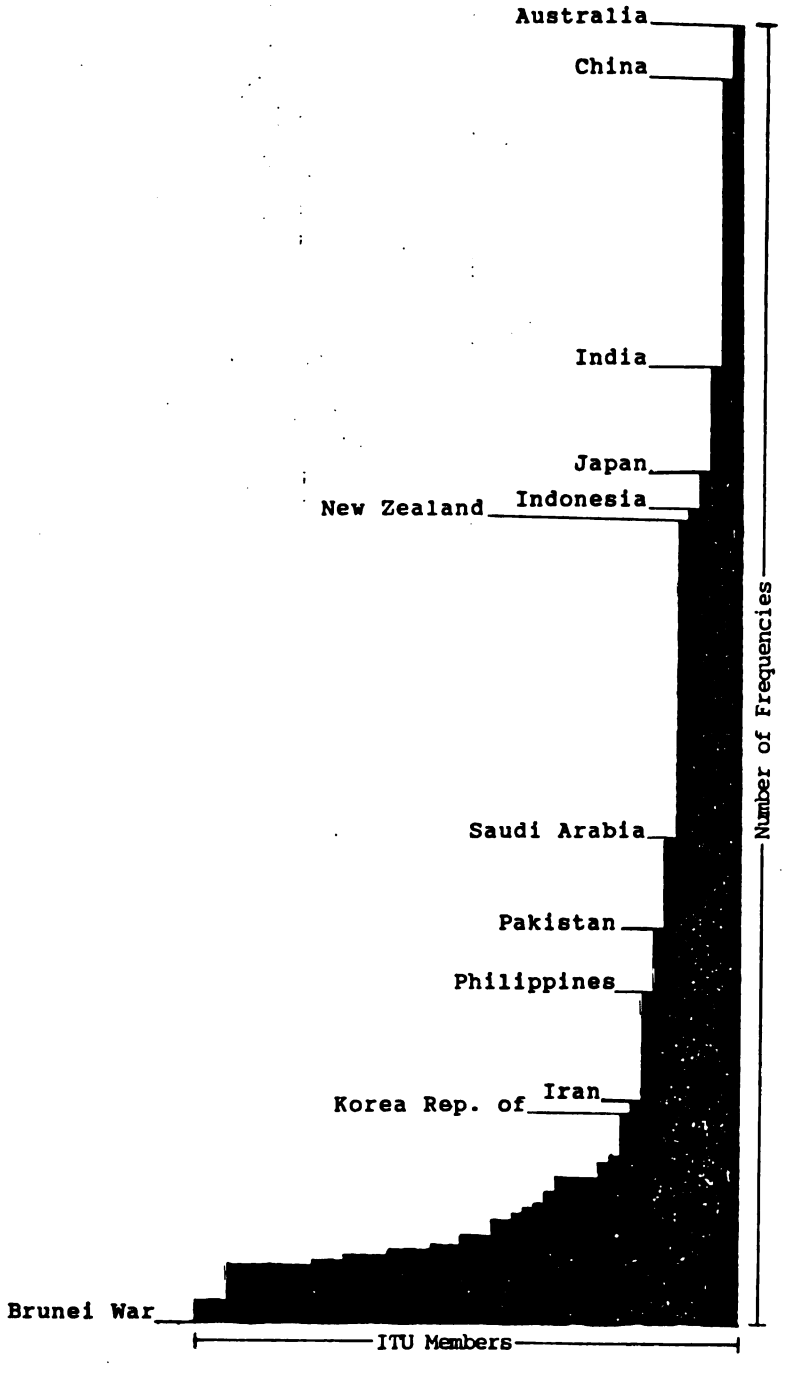


FIGURE 5 : Histogram of Number of Frequencies Assigned to ITU Members in Region 3 up to September, 1987

Summary and Conclusion

This Overview of Frequency Distribution revealed that:

- Most smaller developing nations in Region 1, 2 and 3, are using less than 1000 frequencies per country, as compared to most developed nations.
- Most of the large and newly industrialized developing nations rank in the top twenty users. This group includes the USSR, China, Cuba, Mexico, Brazil and India.
- Worldwide, regardless of region, the pattern of frequency assignment shows most, if not quite all, of the developed industrialized nations to be in the top twenty frequency users (see Table 3).
- The United States has many more frequencies in use than all other countries in Region 2, it uses about 50% of the total number of frequencies assigned in Region 2.

In conclusion, we can say that there appears to be a positive association between the number of frequency assignments and the level of economic and technological advancement of a country, as well as the size of the population and the size of the geographical area. The United States, with the largest number of frequency assignments in the world also has the highest economic and technological advancement. Additionally, the United States is among the twenty nations with the largest populations and land areas in the world. The next chapters will show if

these apparent relationships, as well as the correlations with other selected characteristics are true.

The above-mentioned variables interrelate with the following two ITU policy mechanisms to produce the differences in frequency assignments: the First Come, First Served principle and the policy concerning Modification Cancellation and Review of Entries in the Master Register.

Notes Chapter 3

1. International Telecommunication Union, Radio Regulations (Geneva: General Secretariat, 1986), Art. 13, p. RR13-1.

2. Doc. SEM IFRB 3/86-E, p. 1.

3. Ibid.

4. George A. Codding, Jr. and Anthony M. Rutkowski, The International Telecommunication Union in a Changing World (Washington St.: ARTECH HOUSE, INC., 1982), p. 215.

5. Marcia Scantlebury (Ed.), Reaching for Spectrum: WARC'79 (San Jose: Impreso Por Imprenta Nacional, 1982), p. 271.

6. Ibid.

7. Jean-Luc Renaud, The Changing Dynamics of the International Telecommunication Union: An Historical Analysis of Development Assistance. Dissertation for the Degree of Ph. D. Michigan State University, 1986, p. 235.

Presently, "the high level positions in the ITU are still occupied by officials from the European countries and the USA, and the low level positions by representatives from developing countries." According to an ITU delegate "it is very difficult for delegates of a Third World nation to be promoted to a position previously occupied by somebody from the industrialized world, particularly in specialized organs like the CCI's."

8. Ibid, p. 272.

9. Codding, p. 293.

Other sources of income for telecommunication development projects have always been minor, including income from the ITU's own development fund. As reported earlier the contributions to this fund have never been large, the United States still refuses to contribute to it.

(see also pp. 284-297).

10. Mustapha Masmoudi, The New World Information Order. World Communication. A Handbook George Gerbner and Marsha Siefert (Eds.) (New York: Longman Inc., 1984) pp. 14-27.

11. Radio Regulations, Art. 13, p. RR13-13.

12. International Telecommunication Union, 1978, 1979, and 1980, Report on the Activities of the ITU 1977, 1978, and 1979 (Geneva: General Secretariat, 1978, 1919 and 1980), pp. 25, 21 and 25 respectively.

13. International Telecommunication Convention of Nairobi, p. 23.

14. Honig, p. 50.

15. Sydney Head, World Broadcasting. A Comparative Analysis. (Belmont: Wadsworth Publishing Company, 1985), pp. 19-20.

Chapter 4

RELATIONSHIPS BETWEEN FREQUENCY ASSIGNMENTS PER COUNTRY AND SELECTED CHARACTERISTICS

In order to understand the reasons underlying observed differences in frequency assignments among ITU members, as seen in chapter 3, a first step was to investigate the relationship of selected variables (listed below) to number of frequencies per country. It is understood that a strong statistical correlation between variables is no indication of causality. These correlation matrixes merely generate significant associations between variables for exploration on a country-by-country basis, in chapter six.

In this study, the number of frequencies is the dependent variable and all of the following variables are independent:

1. Age of the Nation
2. Length of Membership in the ITU
3. Political Alignment
4. Number of Telephones
5. Number of Radios — Technological Development
6. Number of Television Sets
7. Number of Circulation of Daily Newspaper
8. Number of Computer Units(only for Latin America)
9. Kind of Economy
10. Gross National Product
11. Per Capita Income
12. Population Size
13. Country Size
14. Education

In other words, it is hypothesized that these selected independent variables are thought to be related to the

number of frequencies assigned to each country.

In order to have consistency of terminology in the interpretation of the magnitude of the correlation, the following rough guide, suggested by Guilford will be used:

<.20 slight; almost negligible relationship
.20-.40 low correlation; definite but small relationship
.40-.70 moderate correlation, substantial relationship
.70-.90 high correlation; marked relationship
>.90 very high correlation; very dependable relationship[1]

Additionally, following the guidelines suggested by Kerlinger; if the coefficient of correlation is less than .30 at the .05 level, the relationship will be considered statistically not significant.[2]

This chapter will attempt to explain the relationships between the frequency assignments to ITU members and the aforementioned independent variables. First, a report is given of the relationships worldwide. Because the variables Political Alignment and Kind of Economy consist of categories and not of numbers, an Analysis of Variance test (Anova) was conducted on them, to find their significance to frequency assignments. Second, all the independent variables except for the two categorical variables (Political Alignment and Kind of Economy) underwent a Multiple Regression Analysis test. Third, the Reliability of the factor (technological development) which explains the most variance in the number of frequency assignment was analyzed.

Report on Worldwide Analyses (N=168)

Five of the selected characteristics (variables) mentioned in the hypothesis are positively and significantly related to the number of frequency assignments to ITU members, worldwide (Table 8). First we will examine the relationships between political alignment, kind of economy and frequency assignments, then some of the correlations will be discussed.

Political Alignment. The means of the three different categories of political alignment: pro-west, socialist and non-aligned are 8981 (N=92), 4368 (N=30), and 1204(N=41), respectively. Although there are noticeable differences between the average number of frequencies assigned to these categories of countries, there is no significant relationship between the number of frequencies and the political alignment of a country (Sig. of F =.909). The insignificance of this relationship can be explained by an examination of the list of frequency assignments. Of the worlds ten largest frequency users, at least two are socialist in their political alignment, the remaining are pro-west (see Table 2). The absence of the non-aligned countries among the worlds' largest frequency users can be explained by the fact that they are all Third World Countries, while many of the socialist and pro-western nations are of the Second and First World.

Kind of Economy. This variable was shown to be

significant, because it separates economies on a basis that directly parallels specific levels of economic development.

The interaction of Political Alignment and Kind of Economy has also been shown to be insignificant with regard to the number of frequencies assigned. We believe that the insignificance of the interaction of these two variables stems from their fundamentally different nature. While Political Alignment has various levels of economic and technological development within two of its three categories, Kind of Economy rigidly separates nations on the basis of development.

TABLE 8

Correlations Among Independent and Dependent Variables Worldwide (N=168)

Variables	1	2	3	4	5	6	7	8	9	10	11
1. # of Frequencies											
2. Population	.29										
3. Land Area	.51	.51									
4. G.N.P.	.83	.31	.61								
5. Per Capita Income	.28	-.06	.07	.25							
6. # of Phones	.83	.22	.41	.95	.30						
7. # of Radios	.80	.47	.53	.88	.17	.35					
8. # of TVs	.85	.28	.65	.99	.25	.92	.89				
9. # of Daily Newspapers per 1000 People	.29	-.02	.26	.31	.75	.26	.12	.30			
10. Literacy	.24	.00	.09	.21	.43	.24	.14	.22	.63		
11. Age Nations	.24	.01	-.01	.13	.24	.20	.06	.11	.32	.27	
12. Length Membership in the ITU	.29	.16	.18	.23	.32	.26	.15	.23	.58	.51	.43

Land Area. The size of a country exhibited a substantial correlation with number of frequencies assigned (see Table 8). This relationship is understandable because the following six nations with land masses of 3 million square miles or more are among the twelve largest frequency users: the USSR(8.6 million, much the largest), Canada(3.8), China(3.7), the United States(3.5), Brazil(3.3) and Australia(3).[3] The incidence of large frequency assignments among large countries is logical because a big country would need many frequencies to transmit information to its distant regions.

The Gross National Product(GNP) shows a marked relationship with the number of frequency assignments (r=.83). We believe that this association is directly related to the high correlation between GNP and the indicators for the factor, technological development (number of telephones (r=.95), number of radios (r=.88) and number of television sets (r=.99))

Level of Technological Development. Because of the marked to very dependable relationship between the number of frequencies and the number of telephones, radios and television sets, we decided to scale these variables into one factor; the level of technological development. This correlation does not tell us if the number of telephones, radios and television sets in a country leads to the acquisition of more frequencies. However, the

interrelationship of these three variables with the number of frequencies assigned indicates that the level of technological development corresponds with the number of frequencies. We draw this conclusion because, as stated earlier; the ITU must be notified by any member country that intends to obtain international recognition, for the use of a frequency.[4] This means that only if a nation intends to use a certain frequency, or is actually using such a frequency; can that frequency be assigned to that nation. All in all, these positive relationships are understandable because, worldwide, it is noticeable that the higher the number of telephones, radios and television sets possessed by a country; the greater is the number of frequencies which that particular country uses. The converse is also true. The continent of Africa which has the lowest penetration of telephones worldwide (Africa 1.8 telephones per 1000 inhabitants, world 27.4 telephones per 1000 people), also has the lowest number of frequencies worldwide.[5]

Multiple Regression Analysis. The proportion of variance in the number of frequencies explained by the factor technological development is .75332. This means that about 75% of the variance in the number of frequencies is explained by only the factor technological development (consisting of number of telephones, radios and television

sets), of a nation. The importance of technological development to frequency assignments can be readily ascertained by a short examination of the following: 90% of all telephone calls originate or terminate in the United States.[6] Less than .5% of the world's telephones are installed in 50 African States.[7]

The next independent variable which explains the most variance in the number of frequencies, is age of nations. The age of the nations, plus technological development; together are explaining a total of about 77% of the variance in the number of frequency assignments. If technological development alone explains 75%, then the variable, age of nations explains 2% of this variance. The age of the nations is the second most dominant variable in explaining the variations in the number of frequency assignments because older nations tend to be those countries which have been free of foreign domination for a longer period of time than the newer nations. Therefore, these nations have been in a position to pursue independent communication policies which have allowed them to develop their own telecommunication networks over time. This historical process does not apply to the newer nations which have achieved their independence more recently. The initial motivation behind the older nations joining the ITU was their need for international coordination in the construction and operation of their telecommunication

networks. According to Scantlebury,

> "a rapid and reliable means of linking the major cities of Europe was important to governments and individuals, but it was essential to the commercial and trading interests of the time. The ITU was the instrument that was created to achieve this goal."[8]

The high costs of telecommunication facilities has favored telecommunication growth in the older nations because the older nations were able to implement the expansion of their telecommunication networks incrementally. New nations however, have found themselves in a position of having to develop in a very short period of time, communication systems equivalent to the systems that have been developed in the older nations over a period of several decades.

According to the result of our Multiple Regression Analysis, no other single factor over and above technological development explains more than 2% of the variance in the number of frequency assignments. Not even GNP does that. GNP is the variable that in addition to technological development has shown to be the most highly correlated to the number of frequencies. Because of the high correlation between Technological Development and GNP (the r's are .95(Telephones), .88(Radios) and .99(TV's)), GNP seemed to effect frequency assignments highly. Our regression analysis has shown that technological development alone explains 75% of the variation in frequency assignments. A matter of interest is the fact that GNP explains 73% of the variation in frequency assignments if technological

development is excluded from the analysis. So, technological development and GNP are explaining (almost) the same variance in the number of frequency assignments. These two variables are overlapping in their explanations of frequency assignments.

Reliability of the Factor Technological Development.

This factor has a marginal but adequate reliability in estimating the number of frequencies (alpha = .76). The variables of which technological development consists have shown the results as in table 9.

TABLE 9

Reliability Analysis - Scale (Technological Development)

Variables	Corrected Item Total Correlation	Squared Multiple Correlation	Alpha If Item Deleted
Number of Phones	.8920	.8578	.6712
Number of Radios	.8835	.7822	.9568
Number of TV Sets	.9084	.8754	.6314

Reliability Coefficients 3 items
Alpha = .7629 Standardized Item Alpha = .9580

An examination of the reliability coefficients, if each of the variables would be deleted shows that the number of radios would be the least reliable variable to predict the number of frequencies in a country. The alpha is .9568 when

the number of radios is deleted from the study. In other words the reliability goes up, from .7629 to .9568, when we delete the number of radios from the study. The number of radios is the least reliable variable because of a number of reasons.

First of all, radios are the least expensive of the three categories of receivers which define technological development in this study. The low price of radios, nowadays, makes them readily available to large segments of the population of all countries.

Secondly, since AM and SW radio transmissions can be received over very long distances, deliberate and incidental transborder broadcasting is a very common occurrence. Therefore, a country does not need to have a large number of frequencies to have a large number of radio receivers. Radiolisteners in many parts of Africa, Asia, Latin America and the Caribbean often have difficulty catching their own national broadcasting stations, but they turn with ease to foreign stations such as the British Broadcasting Corporation, Voice of America, Radio Free Liberty, Radio Moscow and Radio Netherlands.

Since the number of radios has been shown to decrease the reliability of the factor, technological development, for predicting the number of frequencies; in a subsequent study we would delete this variable from our study.

Notes Chapter 4

1. Frederick Williams, Reasoning with Statistics (Austin: Holt, Rinehart and Winston, 1981), p. 132.

2. Fred N. Kerlinger, Foundations of Behavioral Research (New York: Holt, Rinehart and Winston, Inc., 1973), p. 200.

3.Sydney Head, World Broadcasting. A Comparative Analysis (Belmont: Wadsworth Publishing Company, 1985), p. 258.

4. International Telecommunication Union, Radio Regulations (Geneva: General Secretariat, 1986), Art. 13, p. RR13-1.

5. Compiled from statistics from the United Nations. Communication 181, Telefonos, pp. 1018-1021. For the countries, in the different groupings, that did not report information in 1981, the most recent reported data was used.

6. John Williamson, "Africa Telecom '86. ITU Examines Telecom Disparity Between Countries." Telephony (October 27, 1986): 60.

6. Richard E. Butler, "The ITU's role in world telecom development and information transfer". Telephony (August 22, 1983): 80.

8. Maria Scantlebury, Reaching for Spectrum: WARC'79 (San Jose: Impresa en Costa Rica Hecho el deposito de ley, 1982), p. 270.

Chapter 5

RELATIONSHIPS BETWEEN FREQUENCY ASSIGNMENTS AND SELECTED CHARACTERISTICS IN REGION I, 2 and 3

The previous chapter of this thesis dealt with the relationship between the number of frequencies and the independent variables mentioned in the hypothesis, on a worldwide basis. This chapter will examine these same relationships regionally. The association between the selected independent variables and the number of frequencies in Region 1, Region 2, and Region 3 will be examined. Furthermore, the major findings of the worldwide analyses will be applied to each region.

Report on Region 1 Analyses (N=83)

Pearson's correlation coefficient 'r' provides a measurement tool for the values presented in Table 10. The strengths of relationships between the number of frequencies assigned to ITU member nations, and the selected variables; is revealed. From these correlations, we learned that for the ITU Members in Region 1, the number of frequencies correlates high to very high with the same variables found on a worldwide basis; the GNP and the Number of Telephones, Radios and Television Sets. Let us look at some of the meaningful findings in this region, which consists of Europe, the USSR and Africa.

TABLE 10

Correlations Among Independent and Dependent Variables in Region 1 (N=83)

Variables	1	2	3	4	5	6	7	8	9	10	11
1. # of Frequencies											
2. Population	.55										
3. Land Area	.39	.84									
4. G.N.P.	.75	.87	.86								
5. Per Capita Income	.39	-.01	-.06	.18							
6. # of Phones	.87	.62	.44	.80	.34						
7. # of Radios	.71	.90	.86	.98	.15	.78					
8. # of TV Sets	.70	.91	.88	.99	.08	.78	.99				
9. # of Daily Newspapers per 1000 People	.58	.30	.30	.52	.81	.52	.51	.49			
10. Literacy	.41	.13	.06	.32	.67	.42	.32	.29	.72		
11. Age Nations	.54	.08	-.05	.21	.44	.44	.18	.16	.38	.41	
12. Length Membership in the ITU	.47	.22	.10	.34	.52	.50	.38	.34	.68	.67	.47

History. The correlation values of the age of the nations in Region 1 and the length of their membership in the ITU show a moderate and substantial relationship with the number of frequency assignments. This correlation is very meaningful, because many of the oldest ITU members are to be found in Europe. In fact, it was twenty of these same countries who established the ITU in 1865, which makes them naturally, the oldest members of the ITU, with 123 years of membership. Seniority, in terms of ITU membership has facilitated the acquisition of large numbers of frequencies, by historical accretion, over time. Table 5, sets forth the countries in descending order of frequency usage. Most of the ITU Members with the smallest numbers of frequencies are newly independent. These nations started joining the ITU, after gaining their independence in the 1960's.

Table 10 tells us that the population size of Region 1 countries tends to be substantially correlated with the number of frequencies assigned to these countries. The highly populated countries also have the most frequencies. The USSR and several Western European nations are included in this category (Table 5). In contrast, the majority of African nations have much smaller populations as compared to their European counterparts and the USSR.

An exception is South Africa, which in comparison with other countries in Africa has a very large frequency

assignment. This position can be explained at a number of levels. South Africa has a relatively large population. A large population will generally require the use of many more frequencies as opposed to a small population. Also, undergirded by its exploitative apartheid system, South Africa, in comparison with other African countries in Region 1, has achieved a relatively high level of economic prosperity and technological development. The correlation between the number of frequencies and GNP, and the number of telephones in Region 1 suggest marked, definite, and highly significant relationships. Technological development alone explains 75% of the variation in frequencies assigned. South Africa also sits strategically astride the sea lanes from the Atlantic to the Indian Ocean and beyond to the Far East. Economically, South Africa is enmeshed in the fabric of all the Western Economies. It might be allowed that these factors do impact positively in South Africa's favor to secure for South Africa the great number of frequencies which it enjoys.

The high correlation between frequencies and GNP can be explained by the fact that nearly 100% of the industrialized European nations are included in the top twenty list of frequency users (Table 2). Countries with high GNP's are the ones which are in a position to make heavy investment in their telecommunication systems. This investment leads to the application for and the acquisition of frequencies.

Level of Technological development. The correlation of this factor, consisting of the number of Telephones (r=.87), Radios (r=.71) and Television Sets (.70), with the number of frequency assignments shows marked relationships. These relationships are very realistic because nearly 100% of the nations with high technological development are also the nations with high numbers of frequencies in Region 1(see Table 5). Of all the twelve independent variables the number of telephones has the highest correlation (r=.87) with the numbers of frequency assigned. The telephone density in Europe is 41.8 telephones per 1000 people, while in Africa it is 1.8 telephones per 1000 people. The figure worldwide is 27.4 telephones per 1000 people. Africa lags behind with 25.6 telephones per 1000 people below the worldwide average. These findings support the fact that most African countries have less than 1000 frequencies each assigned to them. This contrasts with the European nations and the USSR among which there is the extreme case of one country, France, which has 51564 frequency assignments and an African country, Comoros, which has 55. These findings are supported by the Multiple Regression Analysis worldwide that the technological development and the age of a country explain approximately 77% of the variance in the number of frequencies assigned.

Case Study: The USSR

In pursuing further the area of investigation opened up here, it is time now to see how the aforementioned applies to the USSR. Upon an initial examination of table 2, one is able to note an interesting comparison between the number of frequencies assigned to the USSR and the number of frequencies assigned to some of the larger Western European countries. Historical analysis has shown how a number of factors have interacted with the technological development to produce the number of frequencies currently assigned to the USSR. The first factor is historical. The Bolshevik Revolution occurred during the period immediately prior to the development of radio. At the time of the Revolution, the USSR was a poor country which seemed not to have the resources to spend on the development of radio. To further exacerbate matters, the Russian Civil War took place in the 1920's. The Russians also had to contend with the invasion of American and Japanese troops during the time of their Civil War. Solving such basic problems as hunger took precedence over the development of radio. Then there were the chilling political, social and economic conditions during Stalin's Regime. World War II soon followed and the USSR suffered tremendous civilian casualties. In short, the first 30 years of the Soviet Union's existence were not conducive to the development of extensive domestic radio networks. The historical forces just outlined, did play a

significant part in shaping the nature and extent of the development of telecommunication in the USSR. Other factors have also played a decisive role. The nature of the Government of the USSR delimits the extent of the social and economic role of telecommunication. Radio and television communication are strictly, centrally controlled by the State and of course works against the sort of proliferation which eventuated in the market economy countries of the West, for example in Canada and the United States. It must also be remembered that the general public of the Soviet Union has a significantly smaller income than their Western counterparts, therefore, they are not able to spend as much money on the purchase of consumer, telecommunication equipment. After India, the USSR has the second largest film industry in the world. Since these films are primarily for domestic use, they probably provide a substitute for more extensive television broadcasting. Finally, it is also possible that the Government of the USSR does not wish to develop an extensive domestic, consumer-driven telecommunication network, because it wishes to restrict the channels of information available to its population. All of these factors go a long way to explain why the USSR applied for and uses a relatively small number of frequencies in comparison to most of the Industrial Market Economies in Region 1.

Report on Region 2 Analysis (N=37)

We will examine only briefly, the relationships between the number of frequencies and the independent variables used in this study because selected countries in this region will be dealt with in greater detail in chapter 6. Table 11 shows that in addition to GNP and the factor technological development, population and land area are also highly correlated to the numbers of frequencies assigned in this Region. Presently, a cursory examination of some of the relationships will be undertaken.

History. The fact that most of the older nations and older members of the ITU in this Region have the highest number of frequencies stems from the longer period that these nations have had to develop their telecommunication networks in an environment free from colonial control. The United States, Argentina, Brazil, Mexico, Chile and Panama have all been independent nations for many years and they also joined the ITU many years ahead of the newly independent nations in the Americas.

Level of Technological Development. Similar to both the worldwide and the Region 1 situation, the correlation with the number of television sets, radios and telephones, shows a very dependable relationship with the number of frequencies assigned to these nations. These correlations make sense because the five countries with the most

TABLE 11

Correlations Among Independent and Dependent Variables in Region 2 (N=37)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1.Frequencies*												
2.Computers*	.41											
3.Pop.	.86	.99										
4.Land Area	.75	.93	.79									
5.G.N.P.	.89	.97	.86	.62								
6.Per Capita Income	.68	.00	.55	.72	.63							
7.Phones*	.90	.99	.87	.66	.99	.70						
8.Radios*	.89	.93	.91	.68	.99	.66	.99					
9.TV Sets*	.90	.96	.91	.78	.99	.67	.99	.99				
10.Daily Newspapers per 1000 People*	.60	-.00	.46	.51	.59	.81	.60	.57	.58			
11.Literacy	.28	-.16	.15	.24	.22	.46	.23	.23	.24	.65		
12.Age Nations	.33	.18	.41	.27	.27	.01	.26	.28	.27	-.18	-.30	
13.Length Membership in the ITU	.37	.62	.42	.52	.17	-.14	.18	.23	.23	-.00	.07	.73

televisions, radios and telephones: the United States, Canada, Argentina, Brazil and Mexico also have the highest numbers of frequencies in this region.

One of the reasons why population, Land area and GNP are significantly, highly and positively correlated to the number of frequency assignments, is largely due to the interrelationships of all these variables with the factor technological development, which has been proven to explain most of the variation in frequencies (R^2=.75). In many instances the relationships between these variables are virtually perfect (see Table 11).

Report on Region 3 Analysis (N=48)

Region 3, which is comprised of Asia and the South Pacific, shows different degrees of relationships in many variables when contrasted with Regions 1 and 2 (see Table 12). The highly correlated variables in descending order are Land Area (r=.82), Population (r=.66), Per capita Income (r=.60).

History. The almost negligible relationship of the age of the nations in Region 3 to the frequencies assigned becomes clear if we look at the ages of the countries in this region. We find most of them to be young nations, except for China and Japan, which were never colonized. The lack of correlation is also due to unique circumstances in each case. China was never entirely colonized while India was colonized for about 200 years.

Further evidence indicates, that the population size and the geographical size of the countries is much more highly related to the number of frequency assignments than GNP and technological development (see Table 12). With the exception of Australia, the 5 greatest frequency users in Region 3 are China, India, Japan and Indonesia (Table 7). All of these are large countries with populations in excess of 100 million.

TABLE 12

Correlations Among Independent and Dependent Variables in Region 3 (N=48)

Variables	1	2	3	4	5	6	7	8	9	10	11
1. # of Frequencies											
2. Population	.66										
3. Land Area	.82	.72									
4. G.N.P.	.54	.32	.26								
5. Per Capita Income	.60	-.18	-.03	.15							
6. # of Phones	.39	.09	.06	.96	.17						
7. # of Radios	.59	.70	.64	.56	.06	.40					
8. # of TV Sets	.53	.28	.27	.97	.21	.94	.65				
9. # of Daily Newspapers per 1000 People	.33	-.23	.15	.06	.69	.12	-.14	.09			
10. Literacy	.14	-.04	.04	.20	.20	.23	.07	.32	.58		
11. Age Nations	.00	.01	.03	.06	-.16	.03	-.00	.13	-.11	.00	
12. Length Membership in the ITU	.53	.35	.30	.45	-.09	.41	.33	.43	.20	.20	.42

Level of Economic Development. Only in this region is the correlation of the GNP and the number of frequencies low to moderate. The reasons for these variables being of less significance in Region 3 as opposed to Regions 1 and 2, is due to the presence of the two outliers, India and China. Although these two countries are low-income developing economies they are the most populous countries in the world (approximately 40% of the worlds population). In addition to their large population, these two countries are also two of the three largest nations in Region 3, in terms of geographical size. Population and land area have proven to be much more related to frequency assignments in this region than in Regions 1 and 2 because of the sheer number of people in this region (approximately 60%).

Summary and Conclusion

Worldwide, technological development and GNP have shown to be the most dominant variables influencing the number of frequency assignments.

In Region 1, these same two variables; the degree of technological development, followed by GNP show marked relationships.

Region 2, however, presents a scenario in which, in addition to the marked relationships of GNP and technological development; very high correlations are found with the population size and geographical areas of the countries.

Region 3, presents a different pattern in degrees of relationships between the selected variables and the number of frequency assignments. However there is some similarity with Region 2. The most highly associated variables were geographical size followed by the size of the population.

The variables; literacy, age of the nation and length of membership in the ITU showed to be low to moderate related to frequency assignments. There is usually a substantial correlation between literacy and the variables measuring technological and economic development.

In Region 1, technological and economic development are the most significant variables because Region 1 includes two large subgroups of Industrial Market and

Non-market economies, as well as large subgroups of middle and low income developing economies. In fact, Region 1 includes the largest numbers of Industrialized Market Economies and low income developing economies in the world. Population, in contrast to Region 2 and 3 is much less important in Region 1. In Region 1, only two countries out of 83 have populations in excess of 100 million. In essence, Region 1 is composed of small to moderate sized countries which exhibit great ranges in economic development. The result of this situation is that economic and technological advancement have a much greater effect on applications for and assignments of frequencies, than population.

Region 2 and Region 3 are similar in that most nations in both regions have similar economic status. In Region 2 only one nation is low-income developing; and only two are Industrialized Market economies. Region 3 has only three Industrialized Market Economies out of 48. However, the majority of nations in Regions 2 and 3 are classified, according to the World Bank, as middle-income, developing. The Overall similarity of the majority of economies in Regions 2 and 3 tends to place more emphasis on different variables such as land area and population. In other words, countries with large populations and land areas in Regions 1 and 2, tend to have large frequency assignments. Small nations tend to have small numbers of frequencies assigned.

Another reason for the different correlational values found in the three regions and the global sample stems from the different total numbers of ITU Members in each of the samples. The global sample and the Region 1 sample exhibited similar relationships, while the Region 2 and Region 3 sample also showed similar associations between the number of frequencies and the highly correlated independent variables; technological development, GNP, population size and land area. The similarity between the Region 1 and the global sample is closer than the similarity of the other two regional samples and the global sample, because Region 1 is closer in sample size to the global sample than to the other regions. It should be noted that the two smaller samples (Region 2 and 3) also bear closer similarity in their relationships than they do to the larger samples.

Chapter 6

RELATIONSHIPS BETWEEN FREQUENCY ASSIGNMENTS AND SELECTED CHARACTERISTICS: A CLOSER LOOK AT SELECTED COUNTRIES IN REGION TWO

Now we have seen the difference of spectrum assignments within the ranks of the Members of the ITU. We have also looked at differences inherent within and between each of the three ITU regions. Let us turn our attention to Region 2 specifically. As previously mentioned, Region 2 is comprised of North America, Central America, South America and the Caribbean.

An analysis of selected countries in Region 2 will show different reasons underlying the applications for, and the assignment of frequencies. Selected countries in, first, the Caribbean, second, Central and South America, and, third, North America will be examined.

The Caribbean

The British, French and Dutch, dominated the early development of broadcasting in many of the Caribbean Islands. This domination resulted in the setting-up of broadcast systems which until now continue in centripetal relationships with metropolitan Europe.

These Caribbean communication systems still seem to be more connected to Europe than with each other. Until the present, Caribbean communication links still serve the

needs of interests external to the region. The systems are configured in such a fashion that it is easier and cheaper to reach London, Paris and Amsterdam, than it is to talk between most of the neighboring countries in the Caribbean. For instance, in 1985 the cost of a telephone call from Suriname to Amsterdam was about $ 3.33 per minute while a telephone call to any country in the Caribbean was at least $ 4.44 per minute.[1] This external orientation seems to have constrained considerably the development of broadcasting systems in these islands; this despite the proximity of the American model, which saw the birth of private commercial broadcasting in 1920. An example is Jamaica, where private British business started radio in 1939.[2] The introduction of radio broadcasting in this island may have coincided with the beginning of World War 2. An exception to this pattern was Cuba.

Cuba

Cuba, the largest island in the Caribbean, has few communications problems. This island is one of the nations in which radio broadcasting started in the 1920's[3] , shortly after the United States where it began in the fall of 1920.[4] Then, Cuba's broadcasting was managed similarly to the United States' model, with privately owned stations. In the early 1950's,"Goar Mestre, an entrepreneur of great flair and imagination", developed a network that served the

entire island, making Cuba, "the first country in the world where television was available to the entire population." (Dizard, 1966: 52)[5]. With an historic event like this, it is small wonder that Region 2 presents a correlation of .90 (see table 11) between the number of frequencies assigned and the number of television sets . Additionally we found that the number of television sets is the most reliable predictor of frequency assignments. Again, it is not surprising to find that Cuba has the highest number of frequency assignments in the Caribbean. After the Cuban Revolution in 1959, Fidel Castro, Premier of Cuba, converted the broadcasting system to one of complete government control, modelled on that of the USSR.[6] In other words, Cuba's advantage in its broadcasting system is a product of the era prior to its revolution in 1959.

Today, Cuba's highly developed broadcasting system is aided by the USSR and Eastern Europe, its political allies. Because of this, Cuba can afford to broadcast to worldwide audiences in Spanish, English, French, Creole, Guarani, Quechua, Portuguese and Arabic. Although Cuba's target audiences are generally in the Western Hemisphere, programs are beamed to other areas as well.[7]

In addition to the technological and economic development of Cuba, if we add the factors of population size and land area, it is understandable why Cuba has the largest number of frequency assignment in the Caribbean. Population

and land size have shown to be the third and fourth variable most associated with frequency assignment in Region 2 (see table 11).

Dominican Republic

The fact that the Dominican Republic is the second largest frequency user in the Caribbean, is congruent with this country's position, second to Cuba in terms of population size and geographical size. Remember, population size and land area are highly, positively and significantly related to the number of frequency assignments in Region 2.

Jamaica

Jamaica's frequency possessions profile fits neatly with only one main Region 2 parameter; this being country size. Smaller countries such as Barbados and Trinidad & Tobago also are seen to have small numbers of frequency assignments. Other factors which possibly affect the small number of frequency assignments in these young nations are the legacy of foreign (ex-colonial) interests in, and control over certain segments of their broadcasting industry. There is also the aspect of government ownership of broadcasting systems in Jamaica, which as has been shown elsewhere; tends to have a negative affect on frequency assignments (in terms of numbers of frequencies acquired).

Haiti

Because of prevailing conditions of poverty, Haiti has not been able to develop a vital telecommunication infrastructure which would lead to that country acquiring a large number of frequencies. However, the factors of population size and land area which have been shown to be high correlating factors with the number of frequency assignments; (these factors) seem to work in Haiti's favor as could be expected from the correlation.

Central and South America

The pattern of frequency assignment in Central and South America, stands in sharp contrast to the pattern found in the Caribbean. One main cause for this difference in pattern is the fact that most Latin American countries attained their independence in the 19 century and were able to develop their own particular economic systems. On the other hand, many countries in the Caribbean, in particular the ex-British territories, did not gain their independence until the 1960's. Broadcasting, which naturally involved the use of radio frequencies, played a major role in the economic development of these countries. Also the broadcasting system of Central and South America were influenced by the United States' private, free enterprise system, with minimal government control.

Central America

Nicaragua and Panama

Both Nicaragua and Panama started with privately operated broadcasting systems. In Nicaragua presently the communication media are owned by the Government, while Panama has private commercial ownership. The major reasons for examining Nicaragua and Panama simultaneously are threefold. One, these nations have a history in which the United States has influenced their present level of development. Two, these nations have critical strategic

positions in Latin America. Three, they have similar-size populations.

Despite the fact that Nicaragua is the largest of the Central American Republics and is 1.7 times larger than Panama; Panama has almost 16 times more frequencies than Nicaragua. Over the past 40 years Nicaragua had been constantly involved in Wars. In 1972 a catastrophic earthquake destroyed major portions of Managua, Nicaragua's capital city. Catastrophes of this kind might have had a negative impact on the national (economic and technological) development and by extension, may well have had a negative effect on Nicaragua's acquisition of radio-frequencies. Pearson Correlation presents high correlations between frequency assignments and factors such as technological and economic development. Furthermore, the Nicaraguan media is, presently, government owned and controlled. States with government owned and controlled media systems tend to have fewer stations, than states with private systems.

The high number of frequencies assigned to Panama is a matter of interest. In all likelihood, Panama's large number of frequencies is directly related to the great influence of the United States' investment there. The US was the major force behind the construction of the Panama Canal. During World War 2, the United States began a build-up of military installations in the Panama Canal Zone. The

great American influence encouraged commercial development. Consequently Panama became very important as a regional banking center and as an international center for shipping registration. As with many other countries, an environment of concentrated commercial development has a positive affect on the development of telecommunications.

South America

Brazil, Argentina, and Mexico

In this section, we will examine the reasons for the number of frequencies assigned to Brazil, Argentina and Mexico. Although Mexico lays geographically in Central America, we decided to discuss this country with South-America, because of Mexico's similar characteristics with two other Region 2 ITU members, Brazil and Argentina. These three countries have geographic, historic, political and economic similarities.

- They are the greatest frequency users in Latin America
- They are the largest countries in Latin America
- They are the most populated Latin American countries
- They are middle income developing economies
- They are also "newly industrialized developing nations"
- They have the same political alignment
- They all got their independence in roughly the same period of time, Brazil in 1822, Argentina in 1810-1819 and Mexico in 1822

- These three nations are leaders in national telecommunication investment in Latin America
- They each have the task of serving remote and sparsely populated regions
- Furthermore, Brazil, Argentina and Mexico all started radio broadcasting in the 1920's
- Finally, they have a combination of both government and private/commercial media ownership.

Now that we have seen what these three countries have in common, let us look at the nature of the differences underlying the varying numbers of assigned frequencies. With reference to what we have seen in chapter 5, the factor technological development, the variables GNP, population and land area are the most dominant factors associated with radio frequency assignments in Region 2.

Argentina, with the smallest population and second in geographic size; uses 2.6 times more frequencies than Mexico and 2.1 times more frequencies than Brazil, which covers nearly half of South America. Since the overall distribution of economic benefits is higher in Argentina than in Brazil and Mexico we believe that the proportionally higher GNP is the primary variable affecting the numbers of frequencies assigned to Argentina. Argentina had been much more prosperous in the first half of the 1900's, than it is currently. The reasons for Argentina's early prosperity are as follows:

> "Large-scale Italian, German, and Spanish immigration in the decades after 1880 spurred modernization, making Argentina the most prosperous, educated, and industrialized of the major Latin American nations. Social reforms were enacted in the 1920's, but military coups prevailed 1930-1946, until the election of Gen. Juan Peron as President."[8]

Until the present, Argentina's standard of living is much higher than Mexico and Brazil.

Mexico shares preeminence in the region in terms of investment in telecommunications. Mexico has more frequencies in use than Brazil, another leader in Latin America, in terms of national telecommunications investment. Brazil has 1.7 times more people than Mexico while Brazil's geographic area is 4.3 times larger than Mexico. Brazil launched Brazilsat, its own domestic satellite in 1985. Mexico launched Morelos, its own domestic communication satellite in 1986. Brazil appears to have made greater use of Brazilsat, than Mexico has made of Morelos. Mexico has problems with the full application of its satellite. Since Brazil has more effectively used Brazilsat, the Brazilian Domestic Satellite, then Mexico has been able to effectively use Morelos the Mexican Domestic Satellite. A country's use of satellite communication would seem to have the affect of reducing the need for reliance on larger numbers of internationally assigned frequencies. The Report on the Activities of the ITU (1977) also states that:

> The Board considered, that the use of other high-capacity telecommunication media such as satellite networks, submarine cables, etc. meant that there was less need for frequencies in the HF bands (3-30 MHz)

> for handling traffic on international links. The Board therefore decided to apply the above-mentioned investigation procedure (see chapter 2:author's note) and to examine the frequency assignments to Fixed service stations recorded in the Master Register on behalf of countries which, according to the information available to the Board,were also using other telecommunication media.[9]

In addition, the Secretary of Telecommunication Services of the Brazilian Ministry of Communication, Eng. Jose Bastos Mollica, stated in an interview conducted with him, by this writer, at the ITU Headquarters in Geneva, that the Brazilian Domestic Communication Satellite has solved most of the frequency problems of Brazil. The finding that technological development explains 75% of the variation in frequency assignments reinforces the advantage gained by Brazil in their frequency management. Brazil has one of the most developed radio broadcast systems in the world, linking most parts of the national territory by radio. Only slightly smaller than the United States, Brazil ranks second in the world in number of radio stations. Brazil also easily rates as the most dynamic expanding market in the region. In other words, the reasons why Mexico is using more frequencies than Brazil lie partially in Mexico's underused satellite technology.

Suriname

Tiny Suriname (in terms of population and land area), continues to maintain a higher standard of living than most of its neighbors. Only Venezuela, The Bahamas, Trinidad and Tobago and Barbados have a higher per capita income than Suriname, placing Suriname fifth among the Caribbean and Latin American nations. As shown in chapter 5, table 11, there is a substantial relationship between the number of frequencies and the per capita income of the countries in Region 2 (r= .6791).

North America

The United States and Canada

These two nations together are using most, 54.4%, of the frequencies assigned to all ITU members in Region 2. The United States and Canada are among the most populous nations in Region 2, with the United States being by far the most populous country in the Region. Also these two countries are the largest in geographic area in this Region.

It is in North America where the strength of this study's findings are most clearly demonstrated. In other words, all the variables which are highly related to frequency assignments are present in The United States and Canada (GNP r=.89, Population r=.86 and Land area r=.75). Moreover, the factor technological development explains 75% of the variance in frequency assignments.

In addition to all the above mentioned statistical relationships which affect the large number of frequencies assigned to Canada and the United States, the following can be noted concerning satellite communication in the United States and Canada as opposed to Brazil. Brazilsat is owned, by Embratel, which in turn is owned by the Brazilian Government. In North America there are many privately owned satellites that are used for commercial purposes. Consequently, the use of satellite communication in the United States and Canada is much more commercially oriented

than the use of the only Brazilian satellite; Brazilsat. Research has shown that when the broadcasting systems are government owned the assigned frequencies tend to be less.

Summary and Conclusion

This chapter has shown that in congruence with chapter five, the factor; technological and the variables GNP, population size and geographic area, have high correlations with the number of frequency assignments per country in Region 2. However, variance exists in the manner in which these four factors are weighted among the different countries.

In the Caribbean, we found frequency assignment to be mostly affected by the unique historical experience of the different nations.The most obvious example of this paradigm is Cuba, which benefitted from its historical connections with the United States' economy and continued to improve on its endowments after it changes its political orientation.

In Central America, economic factors were the key to understanding frequency assignments. In essence, the location of Panama made it the ideal location for a Pacific to Atlantic Canal. This in turn encouraged a great deal of investment, and drew the attention of military strategists in the United States. In contrast to Panama, Nicaragua attracted mainly agricultural investment. As a consequence of that situation, it did not experience the same pattern of development of its communications system, nor a scale of development similar to that of Panama's.

Among the major countries of South America, economic and technological development appeared to be the

determining factor for acquisition of frequencies. This can be seen most clearly in the case of Brazil, which has the fewest number of frequencies but also has the most complex system.

As was said earlier, the level of economic and technological development in Canada and the United States effectively put them in a class apart from the other nations in Region 2. Several reasons can readily explain preponderance of frequencies in these two countries. Among these factors are the large size of the two countries. Additionally, both are members of the NATO, which supports their strategic use of radio. Also the United States has a huge population. Finally, the telecommunication systems of these two countries are among the most advanced in the world.

Notes Chapter 6

1. Telecommunicatiebedrijf Suriname, Telefoongids voor Suriname 1984-1985 (Paramaribo: TELESUR, 1984) p. K-L.

2. Sydney Head, World Broadcasting. A Comparative Analysis. (Belmont: Wadsworth Publishing Company, 1985), p. 28.

3. Ibid, p. 14.

4. Ibid, p. 14.

5. Ibid, p. 27.

6. Ibid, p. 28.

7. Donald G. Moore, The Importance of Telecommunications to a Modern Latin America. Thesis for the Degree of Master of Arts, Michigan State University, 1982, pp. 77-78.

8. The World Almanac and Books of Facts (New York: An Imprint of Pharos Books. A Scripps Howard Company, 1978), pp. 652-653.

9. International Telecommunication Union, Report on the Activities of the International Telecommunication Union 1977 (Geneva: ITU, 1978), p. 25.

Chapter 7

SUMMARY, RECOMMENDATIONS, AND CONCLUSION

Sharp numerical differences are evidenced in the assignments of frequencies to different ITU member nations. To understand these disparities, it is essential to have a working knowledge of the factors and actors involved in the assignment of internationally recognized frequencies. It is also necessary to be familiar with the procedures, policies and structural guidelines of the International Frequency Registration Board(IFRB), the permanent organ of the International Telecommunication Union(ITU), which is empowered to register frequency assignments.

At the outset of my research into this topic, I already had fully developed preconceptions about what I would find concerning the practices of the IFRB. In the beginning, I had pictured the IFRB as an organ which was less than enthusiastic in its concern for the needs of the non-western world.

After my brief visit to the ITU Headquarters in Geneva, Switzerland, where I had the pleasure of meeting and conversing with Mr. M.D. Sant, Head of the Office of the IFRB, I came to realize that my preconceptions were based on a less than full understanding of the raison d'etre and modus operandi of the ITU. Furthermore, consultation with

the chairperson of my thesis committee, Dr. Bella Mody, convinced me of the need to approach my research with an open mind. Anyone, it turns out, can acquire a good, working knowledge of the IFRB, by becoming familiar with the provisions of the International Telecommunication Convention of Nairobi, 1982 and the complementary ITU Radio Regulations of 1986, part One and Two.

The findings of this study suggest that the number of frequencies assigned to a country is, for the most part, directly related to that country's degree of technological development, the degree of economic development, the population size and the geographical size. In other words, all these variables are highly, positively, and significantly correlated to the number of frequency assignments.

A global analysis of 168 countries shows that the factor technological development, consisting of the number of telephones, radios and television sets, is significantly correlated with frequency assignments. The interrelationship between technological development and GNP caused these two variables to overlap in the explanation of the variance in frequency assignments. When technological development is removed, GNP explains 73% of the variation in the assigned frequencies. The variable which, in addition to technological development, explains the most variance (77%) in frequency assignments is age of the nation. The reason for the older nations' larger number of frequencies stems from

the longer period of time that these countries have had to gradually implement their communication networks, whereas the newly independent nations have had to developed theirs in a shorter period of time.

To my surprise the relationship between political alignment and frequency assignments was not significant. Our analysis of the three categories of political alignment (pro-west, socialist and non-aligned), indicates that varying levels of technological development are found among both pro-western and socialist countries.

However, the significance of the kind of economy for frequency assignments is not surprising. Whether a country is industrial market, east European non-market, high income oil exporter, middle income developing or low income developing, separates economies on a basis that directly parallels specific levels of technological and economic development.

Regional analyses show the following: Region 1 fits the worldwide pattern, that GNP and technological development affect technological development the most.

In Region 2, in addition to the factor technological development, the variables population, land area and GNP, all affect frequency assignments, highly.

In Region 3, in addition to the factor technological development, the variables population, land area and GNP all affect frequency assignments highly.

A country-by-country analysis in Region 2 (the Americas), shows no single factor has predominance across all countries. In each country, a different factor or set of factors has proven itself to be the most dominant. In Cuba, historic events and economic reasons have proven to be the most dominant. The strategic location of Panama had a decisive(positive) effect on its economic development. This confluence, in turn correlates, positively with the frequencies assigned to Panama. This was not the case in Nicaragua. In Argentina economic development enhanced the need for, and use of a larger number of frequencies. The situation in Mexico and in Brazil, is more complex. By itself, the number of frequencies in use in each country was not a good indicator of the advancement of the communication networks. Brazil needs less frequencies because it uses its domestic communication satellite effectively. This is not the case in Mexico. Here a less than optimum use of Morelos, (the Mexican domestic satellite) leads to the existence of a relatively greater need for ITU assigned frequencies. The United States and Canada possess more than 50% of all the frequencies assigned to the region because they also possess the region's most advanced economies and the most advanced communication networks. These countries are also the largest and are among the most heavily populated in Region 2, the Americas. This finding supports contextual theory that would predict

that the particular forces in each country are important in each specific case, given distinct history and geography (time and space).

In conclusion, the above findings support our prediction that all of the variables used in this study, with the exception of Political Alignment, correlate from slight to very high with the number of frequency assignments of the countries.

How do the above-mentioned variables impact on frequency distribution? These factors express themselves through two ITU policy mechanism. These two policies were drawn up before most of the Third World existed as independent states. The first one is the First Come First Served principle is based on the technological development of the of the ITU Members. This principle tends to give the advantage to technologically well developed nations, since the application and acquisition of radio frequencies is, among other things, based on whether or not a country is able or ready to use the frequency.

The second mechanism is the policy concerning Modification, Cancellation and Review of Entries (frequency assignments) in the Master Register. Due to ITU/IFRB's inability to unilaterally change or cancel these internationally recognized radio frequencies, which do not reflect actual usage, we recommend that:

1. Article 13 of the Radio Regulations should be changed by removing the clause requiring the consent of a country to cancel or suitably modify frequencies that do not reflect actual usage;
2. the procedure designed in 1974, "... to determine which frequency assignments to international links in the Fixed service recorded in the Master Register no longer reflected actual usage of the radio spectrum in the 3 to 30 MHz range, with a view to making the necessary changes or cancellations ...", be resumed.

The implementation of these two proposals would allow some frequencies, obtained under the first come first served principle, to be transferred from the First World to the Third World. As new technology requiring these frequencies is being adopted by the Third World, a plan for the transfer of the appropriate frequencies would appear necessary in the near future. These actions would be steps towards redressing part of the current frequency-gap between the First World and the Third World.

In addition to the ITU/IFRB change its policies and procedures, Third World Administrations need to reconceptualize implementation of Telecommunications infrastructures. A major shortcoming in the thinking of many Third World nations faced with setting up governmental structures which promote development either immediately or directly, or over longer time-spans is that telecommunication is

thought of as a discrete, stand-alone bureaucratic entity. In fact much more suitable to their purposes of development would be the perception of telecommunication as a catalytic element, an accelerator of the essential growth process of development, in all sectors.

The premise of our investigation was based on allegations by Third World Countries that the ITU/IFRB does not provide them with their fair share of the radio frequency spectrum. The real cause is the history of the unequal development of the world. The fact is that older technologically advanced nations applied for and received the world's frequencies earlier. Whether a country was intending to use or was actually using a frequency, was and is one of the ITU's reasonable prerequisites for the notification and registration of that frequency. Thus, it is natural that technologically advanced countries would have most frequencies. What is unfair is that the historical disadvantage of colonization has led today's recently independent countries to be technologically disadvantaged, financially constrained newcomers on the scene after most frequencies have been distributed.

Postscript

Suggestions for Further Research

In the process of this thesis, we came across the following questions that need further research:

.Which proportion(in terms of frequencies assigned) of the radio frequency spectrum does no longer reflect actual use by the administration? Which category of countries are falling under this inquiry? Has the IFRB continued, since 1979, to apply the procedure, which it designed in 1974, to determine which frequency assignments to international links in the fixed service recorded in the Master Register no longer reflect actual usage of the radio spectrum?

.What are the factors and applications of radio frequency assignments that explain their use in multiple regions by ex-colonizers and present day superpowers?

.What is the historical process of the United States' frequency acquisition behavior overtime, and its use of these frequencies in all three ITU geographical regions?

.What are the peculiar circumstances which account for the number of assigned frequencies to specific countries in Regions 1 and 3.

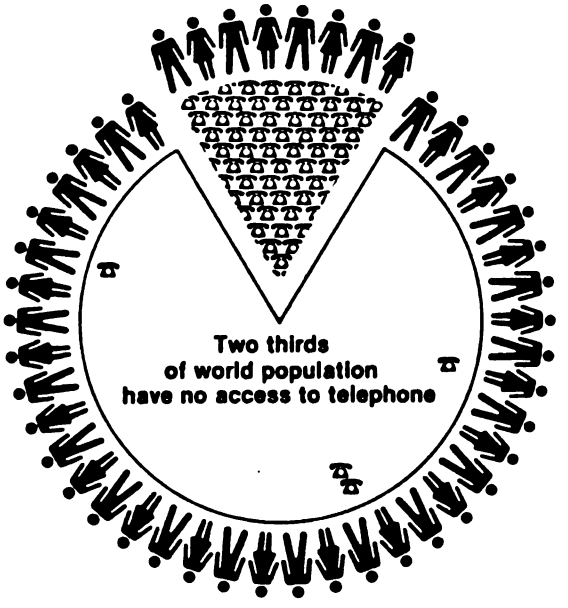
APPENDICES

APPENDIX A

FACTS

DISPARITY OF TELECOMMUNICATION SERVICES WORLD-WIDE

15% of world population uses 85% of telecommunication services



There is a pressing demand for telecommunications in developing countries

PROSPECTS

More and better telecommunication services will provide developing countries with opportunities to step up their economic activity.

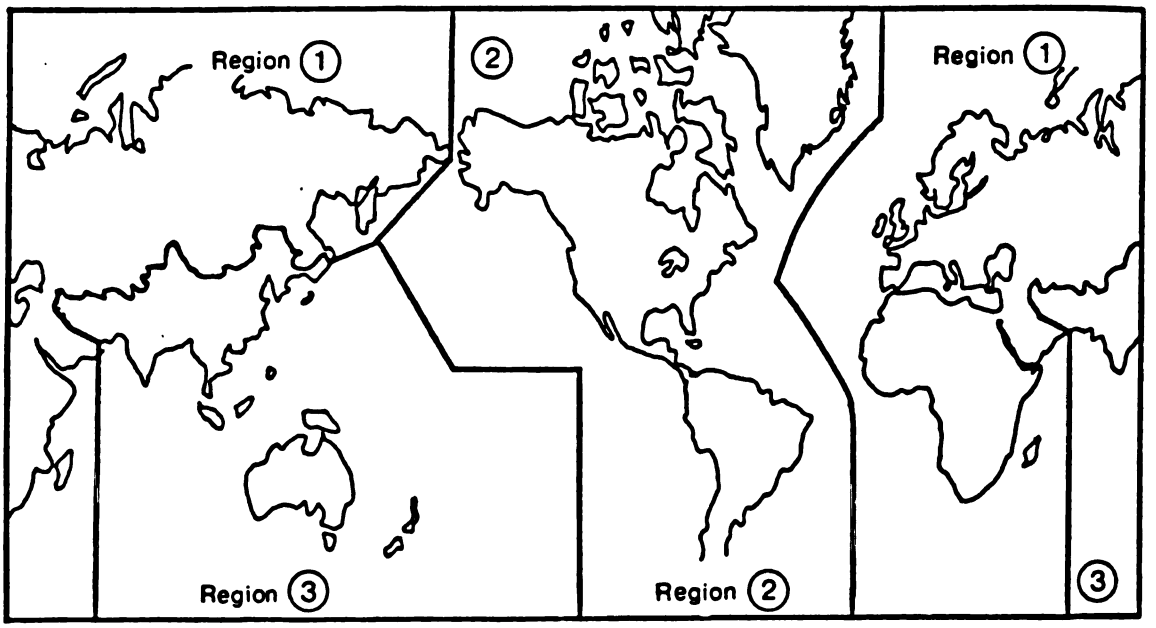
An expanding global telecommunications market and traffic flow will also be of advantage to industrial countries.

Everybody will benefit from improved communication services and facilities accross the world.

Source: Brochure of the Centre for Telecommunications Development of the ITU

APPENDIX C

For frequency allocation purposes, the world is divided into three Regions: region 1, Europe, Africa, Arabia and Russia; region 2, North and South America and Greenland; and region 3, South East Asia and Australia.



Radio Frequency Allocation Regions

Source: "TELEPHONY'S DICTIONARY. TELECOMMUNICATION WORDS AND TERMS"

APPENDIX D

SYMBOLS DESIGNATING COUNTRIES OR GEOGRAPHICAL AREAS

Meanings of the symbols used in Columns B, 4B and 5B

N.B.: The symbols have a geographical significance only. The presence of any given symbol designating a country or a geographical area with respect to a frequency assignment to a station is without prejudice to any question of territorial status which may be involved.

Symbol	Name of the country or geographical area
AAA	Shared throughout the world
AAB	Shared by several countries, but in a restricted area of the world
ABW	Aruba
ADL	Adelie Land
AFG	Afghanistan (Democratic Republic of)
AFS	South Africa (Republic of)
AGL	Angola (People's Republic of)
AIA	Anguilla
ALB	Albania (Socialist People's Republic of)
ALG	Algeria (People's Democratic Republic of)
ALS	Alaska (State of), United States of America
AMS	Saint Paul and Amsterdam Islands
AND	Andorra (Principality of)
AOE	Western Sahara
ARG	Argentine Republic
ARS	Saudi Arabia (Kingdom of)
ASC	Ascension
ATG	Antigua and Barbuda
ATN	Netherlands Antilles
AUS	Australia
AUT	Austria
AZR	Azores
B	Brazil (Federative Republic of)
BAH	Bahamas (Commonwealth of the)
BDI	Burundi (Republic of)
BEL	Belgium
BEN	Benin (People's Republic of)
BER	Bermuda
BFA	Burkina Faso
BGD	Bangladesh (People's Republic of)
BHR	Bahrain (State of)
BIO	British Indian Ocean Territory
BLR	Byelorussian Soviet Socialist Republic
BLZ	Belize
BOL	Bolivia (Republic of)
BOT	Botswana (Republic of)
BRB	Barbados
BRM	Burma (Socialist Republic of the Union of)
BRU	Brunei Darussalam
BTN	Bhutan (Kingdom of)
BUL	Bulgaria (People's Republic of)

(December 1986)

Symbol	Name of the country or geographical area
CAF	Central African Republic
CAN	Canada
CAR	Caroline Islands
CBG	Democratic Kampuchea
CHL	Chile (except Easter Island)
CHN	China (People's Republic of)
CHR	Christmas Island (Indian Ocean)
CKH	Cook Islands
CLM	Colombia (Republic of)
CLN	Sri Lanka (Democratic Socialist Republic of)
CME	Cameroon (Republic of)
CNR	Canary (Islands)
COG	Congo (People's Republic of the)
COM	Comoros (Islamic Federal Republic of the)
CPV	Cape Verde (Republic of)
CRO	Crozet Archipelago
CTI	Côte d'Ivoire (Republic of)
CTR	Costa Rica
CUB	Cuba
CVA	Vatican City State
CYM	Cayman Islands
CYP	Cyprus (Republic of)
D	Germany (Federal Republic of)
DDR	German Democratic Republic
DJI	Djibouti (Republic of)
DMA	Dominica (Commonwealth of)
DNK	Denmark
DOM	Dominican Republic
E	Spain
EGY	Egypt (Arab Republic of)
EQA	Ecuador
ETH	Ethiopia
F	France
FJI	Fiji
FLK	Falkland Islands (Malvinas)
FNL	Finland

Symbol	Name of the country or geographical area
G	United Kingdom of Great Britain and Northern Ireland
GAB	Gabonese Republic
GCA	Territories of the United Kingdom in Region 1
GCB	Territories of the United Kingdom in Region 2
GCC	Territories of the United Kingdom in Region 3
GDL	Guadeloupe (French Department of)
GHA	Ghana
GIB	Gibraltar
GMB	Gambia (Republic of the)
GNB	Guinea-Bissau (Republic of)
GNE	Equatorial Guinea (Republic of)
GRC	Greece
GRD	Grenada
GRL	Greenland
GTM	Guatemala (Republic of)
GUF	Guiana (French Department of)
GUI	Guinea (Republic of)
GUM	Guam
GUY	Guyana
HKG	Hongkong
HND	Honduras (Republic of)
HNG	Hungarian People's Republic
HOL	Netherlands (Kingdom of the)
HTI	Haiti (Republic of)
HWA	Hawaii (State of), United States of America
HWL	Howland Island
I	Italy
ICO	Cocos Keeling Islands
IFB	This symbol indicates recordings in the Master Register which do not result from a notification, such as allotments and frequencies for common use, which are entered by the IFRB in accordance with the relevant provisions of the Radio Regulations. It is also used in some cases in frequency Plans for entries in respect of the requirements of administrations not present at the conference concerned.
IND	India (Republic of)
INS	Indonesia (Republic of)
IRL	Ireland
IRN	Iran (Islamic Republic of)
IRQ	Iraq (Republic of)
ISL	Iceland
ISR	Israel (State of)
J	Japan
JAR	Jarvis Island
JMC	Jamaica
JON	Johnston Island
JOR	Jordan (Hashemite Kingdom of)

Symbol	Name of the country or geographical area
KEN	Kenya (Republic of)
KER	Kerguelen Islands
KIR	Kiribati (Republic of)
KOR	Korea (Republic of)
KRE	Democratic People's Republic of Korea
KWT	Kuwait (State of)
LAO	Lao People's Democratic Republic
LBN	Lebanon
LBR	Liberia (Republic of)
LBY	Libya (Socialist People's Libyan Arab Jamahiriya)
LCA	Saint Lucia
LIE	Liechtenstein (Principality of)
LSO	Lesotho (Kingdom of)
LUX	Luxembourg
MAC	Macao
MAU	Mauritius
MCO	Monaco
MDG	Madagascar (Democratic Republic of)
MDR	Madeira
MDW	Midway Islands
MEX	Mexico
MLA	Malaysia
MLD	Maldives (Republic of)
MLI	Mali (Republic of)
MLT	Malta (Republic of)
MMM	This symbol is used in column 4B to indicate the use of the frequency assignment for inter-ship communications, by the notifying administration indicated in Column B.
MNG	Mongolian People's Republic
MOZ	Mozambique (People's Republic of)
MRA	Mariana Islands
MRC	Morocco (Kingdom of)
MRL	Marshall Islands
MRN	Marion Island
MRT	Martinique (French Department of)
MSR	Montserrat
MTN	Mauritania (Islamic Republic of)
MWI	Malawi
MYT	Mayotte Island
NCG	Nicaragua
NCL	New Caledonia and Dependencies
NGR	Niger (Republic of the)
NIG	Nigeria (Federal Republic of)
NIU	Niue Island
NMB	Namibia
NOR	Norway
NPL	Nepal
NRU	Nauru (Republic of)
NZL	New Zealand

Symbol	Name of the country or geographical area
OCE	French Polynesia
OMA	Oman (Sultanate of)
ONC	Stations of the "United Nations Military Observer Group in India and Pakistan"
ONJ	Stations of the "United Nations Truce Supervision Organization in areas between the Armistice Demarcation Lines at Jerusalem"
PAK	Pakistan (Islamic Republic of)
PAQ	Easter Island (Chile)
PHL	Philippines (Republic of the)
PHX	Phoenix Islands
PLM	Palmyra Island
PNG	Papua New Guinea
PNR	Panama (Republic of)
POL	Poland (People's Republic of)
POR	Portugal
PRG	Paraguay (Republic of)
PRU	Peru
PTC	Pitcairn Island
PTR	Puerto Rico
QAT	Qatar (State of)
REU	Reunion (French Department of)
ROD	Rodriguez
ROU	Romania (Socialist Republic of)
RRW	Rwandese Republic
S	Sweden
SCN	Saint Christopher and Nevis
SDN	Sudan (Republic of the)
SEN	Senegal (Republic of)
SEY	Seychelles (Republic of)
SHN	Saint Helena
SLM	Solomon Islands
SLV	El Salvador (Republic of)
SMA	American Samoa
SMO	Western Samoa (Independent State of)
SMR	San Marino (Republic of)
SNG	Singapore (Republic of)
SOM	Somali Democratic Republic
SPM	Saint Pierre and Miquelon (French Department of)
SRL	Sierra Leone
STP	Sao Tome and Principe (Democratic Republic of)
SUI	Switzerland (Confederation of)
SUR	Suriname (Republic of)
SWN	Swan Islands
SWZ	Swaziland (Kingdom of)
SYR	Syrian Arab Republic

(December 1986)

Symbol	Name of the country or geographical area
TCA	Turks and Caicos Islands
TCD	Chad (Republic of)
TCH	Czechoslovak Socialist Republic
TGO	Togolese Republic
THA	Thailand
TKL	Tokelau Islands
TMP	East Timor
TON	Tonga (Kingdom of)
TRC	Tristan da Cunha
TRD	Trinidad and Tobago
TUN	Tunisia
TUR	Turkey
TUV	Tuvalu
TZA	Tanzania (United Republic of)
UAE	United Arab Emirates
UGA	Uganda (Republic of)
UKR	Ukrainian Soviet Socialist Republic
URG	Uruguay (Eastern Republic of)
URS	Union of Soviet Socialist Republics
USA	The 48 contiguous States of the United States of America (excluding the States of Alaska and Hawaii)
VCT	Saint Vincent and the Grenadines
VEN	Venezuela (Republic of)
VIR	United States Virgin Islands
VRG	British Virgin Islands
VIN	Viet Nam (Socialist Republic of)
VUT	Vanuatu (Republic of)
WAK	Wake Island
WAL	Wallis and Futuna Islands
YEM	Yemen Arab Republic
YMS	Yemen (People's Democratic Republic of)
YUG	Yugoslavia (Socialist Federal Republic of)
ZAI	Zaire (Republic of)
ZMB	Zambia (Republic of)
ZWE	Zimbabwe (Republic of)

APPENDIX E

TOTAL NUMBERS OF ASSIGNMENTS LISTED BY ADMINISTRATION

TOTAL NUMBER OF ASSIGNMENTS = 1028862

NUMBER OF ASSIGNMENTS IN REG 2 = 0482807

ARG *** 100533
USA *** 209199 →
PNR *** 004745
MEX *** 038509
B *** 032975
CHL *** 008247
CAN *** 053855
G *** 000488 →
DNK *** 000667 →
F *** 002280 →
VEN *** 001447
DOM *** 000492
BOL *** 003176
CLM *** 003274
URG *** 011116
CUB *** 004015
SLV *** 000462
HND *** 000468
JMC *** 000137
BAH *** 000186
CTR *** 000072
HTI *** 000048
EQA *** 000845
PRU *** 001769
GTM *** 000979
GUY *** 000223
PRG *** 000579
HOL *** 000319 →
SUR *** 000402
TRD *** 000080
BRB *** 000088
GRD *** 000032
ATG *** 000045
BLZ *** 000109
NCG *** 000297
SCN *** 000037
DMA *** 000031
LCA *** 000042
IFB *** 000476 →
VCT *** 000043
S *** 000008 embassies.
AIA *** 000001
BER *** 000011

TOTAL NUMBER OF ASSIGNMENTS = 1028862
ASSGN (REG 1, REG 3) = 0542087

J *** 014994
LBR *** 000283
NOR *** 014197
F *** 051564
URS *** 046392
POL *** 003377
USA *** 010526
IND *** 016810
AUS *** 024200
G *** 051350
D *** 050617
CHN *** 022977
S *** 007800
TUR *** 003633
I *** 010427
BGD *** 002093
PAK *** 006411
ISL *** 000742
GRC *** 001837
BEL *** 001850
POR *** 002191
TCH *** 003114
MRC *** 001354
BUL *** 000622
EGY *** 000792
HNG *** 000602
DDR *** 030268
HOL *** 003804
QAT *** 000666
UAE *** 000413
DNK *** 015656
E *** 008575
IRL *** 001264
AUT *** 018244
SUI *** 002809
MNG *** 001315
YUG *** 005141
FNL *** 004313
AFS *** 003307
ARS *** 008167
CPV *** 000512
KOR *** 002188
AGL *** 000862

STP *** 000114
INS *** 014379
NZL *** 014124
SEN *** 000899
MLT *** 000566
ROU *** 001234
THA *** 001541
BRM *** 001663
AFG *** 000315
IRN *** 002501
MLA *** 001093
PHL *** 003198
ZWE *** 000768
CBG *** 000119
ETH *** 001065
ISR *** 000863
PNG *** 001608
VTN *** 001736
LSO *** 000141
SNG *** 000877
ZMB *** 000513
MCO *** 000117
MWI *** 000121
LUX *** 000078
TON *** 000064
NPL *** 000097
ALG *** 002006
ZAI *** 001897
BDI *** 000116
RRW *** 000138
GMB *** 000078
TCD *** 001036
CAF *** 000418
CME *** 000712
BFA *** 000306
CTI *** 001228
GAB *** 000582
GHA *** 000975
JOR *** 001484
MAU *** 000145
MLI *** 000451
UGA *** 000352
FJI *** 000404
NIG *** 001668
SRL *** 000312

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KEN *** 000712
SDN *** 000592
SOM *** 000403
COG *** 001148
BEN *** 000154
LBY *** 000719
MDG *** 001558
NGR *** 000351
MTN *** 000913
CYP *** 000400
MOZ *** 001880
YEM *** 000217
CLN *** 000465
SYR *** 000235
TZA *** 000783
GUI *** 000187
BOT *** 000245
TGO *** 000186
KWT *** 000342
KIR *** 000200
IRQ *** 000868
OMA *** 001119
LBN *** 000301
TUN *** 000698
VUT *** 000113
GNB *** 000214
GNE *** 000082
COM *** 000055
SLM *** 000084
TUV *** 000116
ONU *** 000701
BHR *** 001242
NRU *** 000038
SEY *** 000088
YMS *** 000251
MLD *** 000050
KRE *** 000050
DJI *** 000185
ALB *** 000150
CVA *** 000030
BRU *** 000031
LAO *** 000104
SWZ *** 000110
IFB *** 001323
SMR *** 000032
PRU *** 000001
DSPBCOLB ENDED OK
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APPENDIX F

Officials Interviewed at the ITU Headquarters in Geneva Switzerland

1. Mr. M.D. Sant, Head of the Office of the IFRB;
2. Mr. J. Balfroid, Head of the Registration and Publications Division and Operations Department of the IFRB;
3. Mr. J. Lewis, Head of the data Entry and Validation Division of the IFRB;
4. Mr. R. Fontaine, Chief Public Relations Divisions and Editor-in-chief, Telecommunication Journal;
5. Eng. Jose Bastos Mollica, Secretary of Telecommunication Services of the Brazilian Ministry of Communication.

APPENDIX G

The Twenty European Countries that started the ITU

1. Austrian-Hungarian Empire
2. Baden
3. Bavaria
4. Belgium
5. Denmark
6. Spain
7. France
8. Greece
9. Hamburg
10. Hanover
11. Italy
12. The Netherlands
13. Portugal
14. Prussia
15. Russia
16. Saxony
17. Sweden and Norway
18. Switzerland
19. Turkey
20. Wurtemburg

Subtracted from: Documents Diplomatiques de la CONFERENCE TELEGRAPHIQUE Internationale DE PARIS. IMPRIMERIE IMPERIALE. 1965.

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