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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
INTERNATIONAL DEVELOPMENT ASSOCIATION

INDIAN TELECOMMUNICATIONS

Notes on Quality and Efficiency of System

INDIA

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June 1965

Projects Department

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June 1965

INDIAN TELECOMMUNICATIONS SYSTEM

FOREWORD

In pursuance of Terms of Reference dated January 2, 1965 (attachment 1) I have carried out a review of the operations of Indian telecommunications with respect to the general efficiency of their system's work and procedures for maintaining maximum use and quality control of their day to day operations.

Telecommunications staff of varying ranks were visited (attachment 2) at New Delhi, Bombay, Jaipur, Hyderabad, Calcutta and Madras.

Waiting application files for telephone and telegraph services were reviewed. Complaints, orders and requests originating from the public were followed through operations. Reports for management control of efficiency and quality were studied. While it seemed inadvisable to interview telecommunications customers concerning their service attitudes, some personal impressions were formed from use of the service and casual observations of telephone and telegraph use in hotel lobbies and other public locations.

Actual records were examined where available. In some instances, estimates of results were given and are noted in the report. The Indian telecommunications management and staff were most cooperative in producing available information and discussing their work and problems.

INDIAN TELECOMMUNICATIONS SYSTEM

SUMMARY

1.0 There appear to be four major operative handicaps having long term bearing on efficiency and quality of Indian telecommunications services:

- (i) Shortage of capital for new construction.
- (ii) An accounting system which severely limits management control in not providing information on actual rate of return for money spent and for valid cost comparisons.
- (iii) Standards of production which do not encourage efficiency.
- (iv) A labor policy which as presently interpreted is a material burden on innovation and progress.

These four points as they relate to the Terms of Reference are treated in some detail in the general report.

Subject to the above, the use of plant in service is efficient. The quality of installation, maintenance and traffic service for both telephone and telex is good even in the rapidly developing centers. Telegraph service is a weak spot and is treated in the general report.

Present reports and controls appear generally adequate for existing plant and state of development. There is currently a serious billing problem in Delhi. As of July 1, 1964 outstanding revenue was 7-1/2 times monthly billing with over 50% from delinquent government accounts.

2.0 There follow certain representative quality measurements taken from the general report which illustrate general performance.

2.1 Toll Services

Route	-----Average delay in minutes-----					
	1960		1962		1964	
	<u>Urgent</u>	<u>Ordinary</u>	<u>Urgent</u>	<u>Ordinary</u>	<u>Urgent</u>	<u>Ordinary</u>
Major routes	25	60	47	98	48	108
Medium routes	24	33	24	34	27	37
Minor routes	20	30	20	35	18	25

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>
Toll calls per main station per year	126	137	146	152	175

The worsening delays are caused by increasing toll traffic outstripping the small increase in trunk pairs on overhead wire pending the completion of backbone cable routes. These are now being cut in and the situation should be substantially improved by the end of 1966.

Operator speed of answer (seconds):

Assistance & telephone information:

	<u>1960</u>	<u>1962</u>	<u>1964</u>
Large exchange (four largest cities)	7.4	7.4	6.9
Medium exchange	5.2	5.2	7.2

This indeed reflects a good performance.

2.2 Plant troubles per month per 1000 lines:

	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>
Bombay	-	628	672	666
Calcutta	158	219	201	206
Delhi	509	581	571	481
Madras	600	557	647	602
Lucknow	-	504	465	438
Kanpur	-	725	699	646

There is a wide variation in plant troubles depending on central office overloads, age of subscribers' sets and underground versus overhead cables. It is higher than it should be for average plant life but not out of line for the equipment presently working. A further discussion is in the general report.

	<u>1960</u>	<u>1962</u>	<u>1964</u>
2.3 Outside plant telephone and telegraph men per 1000 lines:	10.22	10.89	9.42
Inside plant telephone and telegraph men per 1000 lines:	12.18	15.07	15.15

It is difficult to compare the figures on inside plant men as new exchange installers (capital expense) are included with normal maintenance men (maintenance expense) in the above figures. Presently more men are engaged in installing new equipment than in 1960, but comparative figures are not available. (If the accounting procedures as proposed by Peat, Marwick, Mitchell and Co. are adopted by the Indian Posts & Telegraph Department (P&T) the resultant figures would be meaningful and useful for management purposes.

2.4	Average time to clear customer troubles (based on a sample test)	Bombay	3.8 hrs.
		Delhi	2.5 hrs.
		Madras	1.8 hrs.

It would appear desirable to have such figures on a periodic basis, at least for large exchanges, as they are an important index of performance. The test figures as shown are in a satisfactory range although Bombay is on the high side.

2.5 Telegrams, speed of delivery:

Figures are not available for the speed of delivery of telegrams but the objective minimum is three hours.

2.6		<u>1960</u>	<u>1962</u>	<u>1964</u>
	Total telegraph complaints	59,650	61,430	68,769
	Complaints per 10,000			
	Messages telegraph	15	15	12

These are the recorded figures but they do not represent the quality of service discussed in the general report.

2.7		<u>1960</u>	<u>1962</u>	<u>1964</u>
	Traffic operators per 1,000 lines	18.06	18.04	19.73

In view of the rise in toll traffic and waiting time for circuits together with increase in calls for special service, these figures are not out of line. High off duty time in some instances over 30% also has a material bearing on these figures.

3.0 The management are capable, interested and cognizant of their problems. There appears to be a reasonable age spread to assure good management continuity. The Development Research Center staff phase in well with the operations and factory groups are developing equipment to meet current Indian needs. Because of the relatively low present telephone development and the high demand in India, the telecommunication system in the next five to ten years could leapfrog one or two generations of transmission equipment now in service in more highly developed nations. In the last ten years, India, among all nations with 500,000 telephones, is second only to Japan in rate of growth (India 3 times - Japan 4 times). Management looks forward to cut costs of trunk circuits per mile by as much as 50% which will permit extension of telephone offices to all towns and large villages more rapidly. It is their desire to establish telephone exchanges within the next ten years in all communities now serviced by telegraph connections (Centers of over 5,000 people). This however cannot be reached with budgets at present level.

4.0 Introduction of subscriber toll dialling has been a major success and should demonstrate to the Indian public and government that wise telecommunication investment provides a major contribution to the Indian business economy. The management is aware that the use of the more sophisticated telecommunication equipment is to cut costs and improve service will require more technical knowledge and a higher degree of training for proper utilization. It is most important that training and rates of pay consistent with these higher requirements are provided and that qualified personnel is ready before equipment is placed in use. According to present pay scales operators and clerks, who require a minimum of training, receive one-third higher pay than central office mechanics who require one year of formal training. The correction of this incongruous situation should receive a high priority in view of the large expansion now underway and it is difficult to over emphasize this problem. The creation of a small working group with direct access to top management would be of material aid in meeting these present and coming problems. With adequate funds for new construction and positive action, particularly on points two, three and four of the first paragraph, there appears to be no reason why telecommunications development should not expand very rapidly in the next ten years to the material advantage of the Indian economy.

INDIAN TELECOMMUNICATIONS SYSTEM

GENERAL REPORT

Traffic Service

5.0 Under this heading traffic service is discussed in the various phases of operation relating to the origination of customer telecommunication traffic and the handling of the telephone call or telegram to its completion. Attachment 3 shows the quality of dial switching service 1961 through 1964. This data was obtained for the principal cities but was not available for the entire Indian operation. In 1964 the percentage of calls completed ranged from 59.7 to 70.3. An analysis shows that while some of the calls were lost due to equipment faults or to overloading in the automatic switching equipment the main reason for the non-completion of calls was due to the called number being engaged or due to the absence of the called party from his telephone.

5.1 Accepted telephone engineering standards call for one lost call in 500 at each step of selection in automatic switching or the possibility in a five digit selection of one call lost per 100 in the switching train. This is reasonable. In most of the cities of India the lost calls in the switching equipment are greater than one in a hundred due to the heavy loading on switching plant but the service may be regarded as reasonable and additional switches have been installed in heavily loaded sections wherever space permits. One of the worst instances of overloading occurs in Lucknow where a loss of six calls per hundred takes place due to overloaded plant. The general figures indicate a full or overload use of equipment.

6.0 Delays on special operator services covering number information, special and assistance calls were as follows:

	<u>1961</u>	<u>1962</u>	<u>1964</u>
Speed of operator answer percentage over 10 seconds	7.4	7.4	6.9

This is good service.

7.0 Total complaints for local telephone service per 1000 telephones per month relating to out of order, poor service and wrong numbers:

	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>
Bombay*	-	758	753	762
Calcutta	283	338	325	336
Delhi	1,431	1,417	1,542	1,543
Madras*	623	623	529	546
Lucknow	-	936	811	926
Kanpur	-	1,208	1,269	1,599

Madras faults found on routine tests are not included

* In these cities repeat complaints have not been included.

It is difficult in the period available to draw conclusions from this table. Various influencing factors, such as age and type of outside plant, central office overloading, buried or overhead wire, all have an influence.

As discussed under plant operations, 60-80% of out of order complaints come from faults on the customers premises either on wiring or sets. A periodic analysis of causes of complaints would appear warranted.

8.0 Presently there is no analysis made of total public criticism covering such items as waiting lists, directory errors, slow bills, etc. The material is there but unassembled and should be processed to be of help to management in judging performance.

General Discussion

9.0 As observed in the summary, the traffic operations under prevailing conditions are good. There follows some suggestions which might be of value as the Indian system expands.

Telephone Directories

10.0 The primary purpose of a telephone directory is to assist subscribers in making calls. It also can produce revenue from advertising and generate a net profit. As an example the gross cost per book in Bombay is Rs. 3.3. The sales revenue per book is Rs. 4.17. The net profit is Rs. 0.82 which could be greatly increased by the extended use of commercial advertising as suggested later.

10.1 When new directories are printed they are sent to directory distribution centers and customers are advised to pick them up. An estimate was given that 10% of total customers had not picked up their new directory after 30 days. For this reason full advantage is not taken of the new printed book with some unnecessary repercussions on customer service. This could be materially improved by a direct delivery to the customer either through the post office or by the telephone organization utilizing non-skilled personnel which are now on the payroll. It should decrease calls to information, increase recovery of old directories and it has sufficient appeal as a customer service to warrant a trial. Various estimates made show that from 50% to 75% of the calls to information were made for entries in the existing directory. The reasons given for this range from illiteracy to the relative ease of securing the number wanted from the information operator.

10.2 In most of the large cities, directories are published every six months and supplements are distributed for major telephone rearrangements or additions.

Many countries publish directories once a year with or without an interim addenda distribution. Consideration could be given to trying a 9 or 12 month book. In Bombay, such a procedure would reduce annual paper tonnage from 160 to 120 tons with a nine month book or to 80 tons with a 12 month book.

10.3 Directory revenues come from advertising in the alphabetical section (bold type listings - margins) and one or two classified sections. In Delhi, the first section is a business classification permitting listings with written advertising matter, the second is classified by business types and margins are permitted. Other cities publish only one classified section consisting of paid for listings.

In the long run, value to the advertiser is determined by customer usage. Nowhere can an Indian telephone customer find all local electricians to choose from or all restaurants, etc., as a complete classified list is not available, since both classified lists contain only those businesses who pay for being listed. By furnishing one free classified listing to each business customer to establish a complete list and then selling bold type, column space, display space and extra classifications, the customer receives a better service. Advertising because of the competition should increase. This public offering could afford a clear cut customer advantage over outside directory competition which now exists in the form of privately printed competing directories that do not have complete lists. A three year trial under vigorous selling management would appear more than warranted. No major capital or no foreign exchange is involved and the profit reward could be high.

Directory service improvements may reduce operator and central office switching loads.

11.0 The introduction of call queuing (holding of incoming calls in time sequence for completion when first terminating line is available) has been immensely helpful in the handling of assistance and toll booking traffic. A recorded announcement should also be used in order to inform the customer of reasons for delay.

12.0 Many large customers have usage which justify private wire or tie lines by-passing the central switching machine and going directly point to point. Some of these are already in service. As trunk relief is obtained, it is understood that provision is being made for this type of service wherever possible it should be encouraged. While this takes outside plant, it does not take central office switches and with appropriate rates this service is very profitable. There is a great tendency on the part of such heavy use customers to hold connections thus in effect creating a private line holding Central Office equipment in use. Where point to point customers are in the same exchange, no trunk facilities are required.

13.0 The foregoing suggests that there might be organized a small engineering-sales force for the profitable improvement of customer service. The basic purpose would be to place customer services, present and future, where they are most needed. Even with a formidable held order situation it is important to look at the service of present overloaded customers. They could also be useful in determining proper customer use of telegraph, teleprinter and telex.

14.0 The introduction of subscriber toll dialling has been a good forward step. Planning people are counting heavily and properly so on the extension of this service to keep to a minimum the installation of more manual toll positions and at the same time to improve greatly the quality of toll service. The complete cost of manual operating, ticketing and billing per

call is estimated at Rs. 0.455 with some toll messages billed at Rs. 0.30. It is obvious that the mechanization of short haul traffic to a message register basis is a major improvement for the country.

14.1 RISE IN TRAFFIC ON INTRODUCTION OF SUBSCRIBER TRUNK DIALLING (STD)

<u>Route</u>		<u>Ratio of STD Completed Calls to pre-STD Calls in 1965</u>
Delhi-Agra	(July 1962)	31.4 : 1
Kanpur-Lucknow	(November 1960)	26.9 : 1
Delhi-Jaipur	(September 1964)	26.6 : 1
Delhi-Kanpur	(January 1965)	26.3 : 1

This dramatic increase was due to rate reductions and the faster "when you want it service" with the elimination of the recording operators.

14.2 There follows a statement of cost to subscriber per call as the result of a decrease in minimum call time.

Cost to subscriber per trunk call

<u>Route</u>	<u>Pre-STD</u>			<u>STD</u>		
	<u>Holding Time</u>	<u>Cost</u>	<u>Min. Time Charge</u>	<u>Holding Time</u>	<u>Cost</u>	<u>Min. Time Charge</u>
	<u>Mts.</u>	<u>Rs.</u>	<u>Mts.</u>	<u>Mts.</u>	<u>Rs.</u>	<u>Seconds</u>
Kanpur-Lucknow	4.5	1.50	3	2.1	0.51	24
Delhi-Agra	4.5	4.50	3	0.94	0.52	12
Delhi-Jaipur	4.5	4.50	3	1.09	1.19	6
Delhi-Kanpur	4.5	6.00	3	1.08	1.19	6

With the improved service therefore, the cost per call to customer decreased markedly.

14.3 There follows the revenue per circuit together with total calls.

Pre-STD and STD Revenue Per Circuit (daily)

<u>Route</u>	<u>Pre-STD Total Calls</u>	<u>Pre STD* Revenue Per Circuit</u>	<u>STD Revenue per Circuit</u>	<u>Post STD Total Calls</u>
Kanpur-Lucknow	441	Rs. 250	Rs. 123	20,073
Delhi-Agra	500	155	232	25,343
Delhi-Jaipur	400	325	218	14,254
Delhi-Kanpur	550	412	353	18,010

It will be noted that pre-STD revenue per circuit is somewhat higher than post-STD revenue per circuit. However, this is more than offset by the lower cost per circuit mile because of the use of coaxial cable. The total return on any particular route is of course greatly increased by the larger number of circuits in use.

* Costs of ticketing and billing not present in post-STD have been deducted from total revenue to make valid comparison.

14.4

STD Traffic - Circuit Utilization
Paid Time and Revenue per Circuit

<u>Route.</u>	<u>Number of circuits</u>	<u>Circuits utilization per circuit per day</u> Hours	<u>Paid time per circuit per day</u> Hours
Kanpur-Lucknow	38 (2)*	9.12	6.62
Delhi-Agra	36 (4)*	8.19	5.79
Delhi-Jaipur	47 (5)*	4.97	3.29
Delhi-Kanpur	28 (4)*	8.38	5.01

14.5 Circuit utilization will obviously drop whenever a change is made to STD because of the elimination of operator recording time and waiting time for the called party. Non-STD means higher utilization, but poorer service to the customer. In 1964 the average wait after recording until connection was established averaged 108 minutes for ordinary toll calls on major routes. As new equipment is installed the share of STD toll traffic is estimated to increase from 25% in 1965 to 84% at the end of the next Five Year Plan. This project will achieve a major improvement in service.

14.6 Operator toll dialling, which gives faster, better and cheaper service than the old manual method through the elimination of one operator, is also expanding. There are now 180 single link routes and four routes of more than one link. At the end of the Fourth Five Year Plan these are estimated to be 500 and 32 respectively.

15.0 At present no record is maintained of the speed of answer of subscriber signal at the local manual exchanges. Load figures are derived from the number of calls handled per busy hour and lines are adjusted between the different switchboard positions to balance the load but service as the customer sees it (how quick does the operator acknowledge) is neglected. As systems grow, particularly in the circle exchanges, this would appear to be a desirable management tool.

Accounting

16.0 The draft report of a Review of the accounting procedures of Indian telecommunications operations, prepared by Peat Marwick Mitchell and Co., contains many recommendations which could be most helpful to the management of the P&T, if adopted. For example, one common measurement in use in other telecommunications systems is to compare current net capital expenditures with net revenue increases to determine profitability of new construction jobs based on the actual cost.

In the Indian operation, small capital expenditures are charged to operating expenses. The frequency or volume of such small expenditures accounts for over 35% of the real capital expenditures. Thus investment is understated, expense is overstated and no reliable control or comparison is possible on rate of return.

* Number of circuits pre-STD.

Billing

17.0 In most centers the billing operation is good taking into account the procedures used. New Delhi is an exception, and the present operation is poor. An estimate was given that more than 50% of the outstanding bills were owed by government entities. The government audit procedure is cumbersome and under their directions no bills are paid until each toll call and extension charge is verified. This is somewhat unfair in the sense that on the average it takes the P&T seven and a half months to collect for these bills. The amount involved is currently over Rs. 25.5 million. It would seem that it should be possible to reach an arrangement for paying bills as rendered with appropriate adjustments reflected in the subsequent bill.

17.1 There also appears to be a reluctance in Delhi to follow collection routines and termination of service in case of non-payment. Some of this is due to late billing, although there appears to be a reluctance to deal with political and prominent business people in a manner to assure payments within reasonable periods. This is substantially a matter of policy and no recommendation is made.

17.2 True automation of billing work would appear impractical for some time to come. There appears however to be a real opportunity to streamline the manual procedure to avoid copying and transfer of records. These steps could be taken and actually must be done before any real automation can be considered. The working space in Delhi is poor and crowded, equipment sub-standard and absence is high. On the day visited 40% of the staff was absent.

There are simpler manual billing procedures available than those being used, and these would greatly improve accuracy, cut cost and save time. In addition the service order procedures, from receipt of request to completion of the order, directory advice, billing advice and advice to traffic information could be improved.

17.3 There is very little use made of bill inserts to educate the public on the progress and problems of the telephone and telegraph operations. The P&T has much to tell about progress, the problem of long holding time, the promotion of toll trunks usage in off hours and kindred subjects. Bill inserts are a good and inexpensive medium for these purposes.

17.4 It might be helpful to segregate long overdue and extremely doubtful accounts from those for which there is a reasonable chance of collection. This could be done by the establishment of an uncollectable reserve to which would be charged amounts of bills on which hope of collection is nil or where for which long-drawn out law suits are necessary. Any subsequent recoveries would be credited to this account. The separation has the merit of giving better control of collection work and current outstanding bills.

Under present collection routines a registered letter request for payment is sent. This is costly and unnecessary if a telephone call is made before service is suspended.

17.5 While it is mentioned here, under Billing, the use of part time employees during peak periods should be effective. This is a common practice in other countries and a part time force usually consists of former employees who do not care to work full time or persons who for many reasons may not care for regular employment. In many countries, traffic and accounting departments have also used students on vacation to do productive work and at the same time judge their competence for possible future full time employment.

Waiting Lists

18.0 A list showing the status of applicants waiting for telephone service as of September 30, 1964 for 2207 telephone exchanges was reviewed. While some very small exchanges have no waiting applicants large city exchanges are badly congested. The statement 4 attached, gives an analysis of waiting lists by time and number in principal cities.

18.1 Telephone applications are classified by categories. If an applicant is willing to pay Rs. 2,000 on the "own your own telephone" plan, he is placed in a high preference category. Under this plan, he is billed at a lower rate to achieve a repayment of the amount without interest over 20 years. If he cancels before his refunds have equalled Rs. 500, he loses the difference between his credit and Rs. 500. Statement 4 attached gives details of this procedure. The present waiting list procedure seems to work fairly satisfactorily in a difficult situation.

19.0 The use of public telephone in open public areas has been tried to furnish some form of telephone service to the general public. The incidents of robbery and destruction made this impractical on a large scale. Pay stations are now being placed where they can be watched by an attendant, such as gas stations and stores. Proper planning of these installations might be the duty of the engineering-sales group mentioned earlier in this report.

20.0 There is also a growing waiting list for telex service; at present service is furnished in five exchanges with a capacity of 900 machines. By the end of the Third Five Year Plan (March 31, 1966), 30 exchanges would be working with a capacity of 2,730 machines and during the Fourth Five Year Plan the number of exchanges should reach 88 with a capacity of 17,800. The present bottle-neck is production of the Olivetti type machines in the Indian factory but there are no insurmountable obstacles and an improvement should be achieved. Below is a statement of teleprinter production anticipated during the fourth plan period.

	<u>Page Model</u>	<u>Tape Model</u>
English:		
Telex	9,000	-
Gentex	-	3,500
Other Users	2,000	-
Spares & misc. e.g. VFT monitoring, training centers, etc.	<u>1,000</u>	<u>500</u>
Total	<u>12,000</u>	<u>4,000</u>

Hindi:

For District telegraph offices and other users	100	100
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Note: The manufacturing capacity of H.T.L. for Tape and Page Models is over 2,000 machines a year during 1965-66 and 1966-67, working up to a total of over 8,000 machines a year by 1971-72. 50% of this output will be made available to the P&T. The rest will go to Defense, Civil Aviation, Railways and various other users.

TELEGRAPH SERVICE

21.0 Reference was made in the summary to message telegraph business. This is a weak spot because of lack of mechanization and manual handling at switching points together with many circuit troubles. In some instances mail is resorted to because of circuit difficulties.

During the Third Five Year Plan it was envisaged that in addition to opening of 2,000 new telegraph offices, 26 Automatic Teleprinter Exchanges (Telex) would be opened at principal towns amounting to a total of 2,500 lines. The plan also included introduction of General Telegraph Exchanges (Gentex) for expeditious transmission of public telegrams.

Under the plan 1,200 telegraph offices have been opened by the end of December 1964 and it is expected that the target will be more or less fulfilled.

22.0 Automatic Telex Exchanges are already working in Bombay, Calcutta, Delhi and Madras and exchanges at six more stations are due to be opened within a couple of months. It is expected that by the end of the third plan there will be 16 telex exchanges in existence.

23.0 The improvements contemplated on public telegraph service were:

- (i) provision of a large number of telegraph circuits interlinking the cities;
- (ii) provision of faster transit facilities at important centers, and
- (iii) expediting of the delivery arrangements.

23.1 In regard to (i), the position has considerably improved by the addition of a large number of voice frequency telegraph circuits; 2,000 channels have been added during the Third Five Year Plan so far and 1,000 more are expected to be added further in the last year of the Plan. The proposals in regard to (ii) and (iii) envisage the provision of Gentex at important centers providing automatic switching of telegraph circuits under the control of terminal telegraph stations. Details of such a scheme have been worked out for the northern part of the country and the sanction for the installation of a 600 line General Telegraph Exchange at Delhi has been sought. The installation of the equipment, however, is likely to commence only during last year of the Plan.

The scheme provides for the transmission of telegrams directly to most of the Telegraph Offices in the region. In larger cities there will be a number of Telegraph Offices connected to this system so that telegrams are routed to points as close to the addressee as possible; thus reducing the effort and time required in delivering them.

PERSONNEL, TRAINING AND MEASUREMENTS

24.0 There was reference made in the summary Points (iii) and (iv) to operative handicaps in standards of production and present interpretation of labor policy. This is of course in some degree tied to government policy and tradition but the handicaps are real and are of sufficient long-term importance as to justify continuous consideration at the highest level. The rapid growth of telecommunication in India, the development of major trunk networks, the forward program of installation of small dialling offices, the program of extending telecommunications to rural areas, together with the possibility of educational television for rural areas, give importance to the problem of organization. If an integrated telecommunication organization separated from the Post Office, such as exists in Canada or the United States is not feasible, then it will be essential to have a firm separation of accounts so that it is possible to determine accurately the financial position of the telecommunication services of the Department.

As the telecommunication system develops, the management should have the authority to spend funds within their pre-determined budgets but with some flexibility to meet current conditions. In principle, there should be one line of authority after a budget has received governmental approval. This does not exclude the central government as the final authority but it deputizes authority with the power of review and of holding telecommunication management accountable.

25.0 It should be possible for the general manager to establish personnel and operating procedures and in general have full control of his organization as long as the goals agreed upon in the budget are achieved.

26.0 Outside of these semi-political problems, there appear to be opportunities for improvements within the present organization. From various field operations people information was obtained that fixed work standards of production are established according to which a sanctioned number of personnel is assigned to each function such as outside plant, central office

maintenance, toll clerks, etc. To this is added an allowance for sick leave and other causes of off duty. (Presently this allowance is 10% although absence is subsequently higher). The present standards were introduced in the 1940's, and in many operations, these no longer fit, and a thorough review is over-due.

27.0 Appendix F 11 of the Peat Marwick Mitchell & Co. report deals with sampling and quality control. Certain suggestions have been made in this report for periodic reports by districts on certain operations reflecting quality and quantity of performance. These could include billing errors per 100 accounts, plant troubles reported per 1,000 stations, speed of answer at toll boards etc. Where these results are used for comparative purposes it is desirable that the observation or checks should be done by personnel outside of the district of people being tested and that auditors at proper intervals and with adequate sampling should check the results to assure management of the general accuracy of the reports.

28.0 In personnel practices and particularly pay scales there appears to be too much dependence on procedures of other government agencies and of the Postal Service. It does not appear to be appreciated that the advanced new techniques in telecommunications such as cross bar switching systems, solid state components and microwave equipment requires specialized and highly trained personnel. The general attitude seems to be that a maintenance man is a maintenance man regardless whether he is responsible for a simple manual office or servicing a complex dial switching unit. As an example the craft pay scales indicate that the top pay for an outside plant 1 line man is Rs. 95 a month, a sub-inspector earns Rs. 155 per month and cable jointers Rs. 180 per month. For a local exchange man the pay is Rs. 180 per month. These jobs require 3 to 12 months of training. On the other hand, switchboard operators and clerks receive a top pay of Rs. 240 per month and require no more than two months training.

29.0 It should be possible to develop some simple production measurements units based on work performed. This could be done through time studies or taking as an objective the performance of the two best districts in each category. It has generally been found that a reasonably productive pace of work increases accuracy and improves morale. Such measurements are usually used for group performance and current results of each district are given each month to every other district. The practical results of these procedures is that fewer people are needed. This does not imply a lay off but rather a freeze on added hiring of unskilled labor and the training of suitable candidates for more demanding work. With the expansion planned, this could be accomplished gradually with no decrease in force. New equipment and tools will lessen maintenance hours but will increase the need for technical qualifications. With the challenging expansion job ahead, with full utilization of plant, such measurements could give added competitive incentive for good performance.

30.0 This growth in skilled personnel force, with its attendant increased wage rates, rapid changes in force compositions and the introduction of classifications for new type of jobs might warrant employment of a qualified personnel manager thoroughly experienced in technical and operations work, reporting directly to the management of the P&T. Part of his responsibilities

would be to establish an analysis of job evaluations in all departments of the P&T and make comparisons with salaries in other government industries and in private business. With proper documentation possibly more could be done in furthering the understanding among other government officials of telephone operating problems. Such an officer because of his work, could also be helpful in dealing with the personnel problems not settled at the local level and to deal with the very real problem of absenteeism.

Plant Operations

31.0 As reflected in the summary, the plant force per thousand lines is shown:

	<u>1960</u>	<u>1962</u>	<u>1964</u>
Outside men per 1,000 lines	10.22	10.89	9.42
Indoor men per 1,000 lines	12.18	15.07	15.15

As indicated in the summary, it is difficult to make comparisons. More men are now engaged in installing new equipment, but there are no current separate figures. These should be kept. No continuous record is maintained of average time to clear troubles but tests in Bombay show 3.8 hours, Delhi 2.5 hours and Madras 1.5 hours. There follows a statement of trouble rates for six principal cities:

32.0 Plant Troubles per Month per 1,000 Lines

	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>
Bombay	-	628	672	666
Calcutta	158	219	201	206
Delhi	509	581	571	481
Madras	600	557	647	602
Lucknow	-	504	465	438
Kanpur	-	725	699	646

These trouble rates are high but are being given special attention by field personnel and the Development Research Center. Because of shortages, tremendous efforts are being made to re-use old equipment. Telephone repair shops are efficient but at some time in the not too distant future, more old sets must be junked if the quality of service is to improve.

32.1 Of troubles found, the percentages indicated below were on subscribers premises, either in the wiring or in the telephone sets:

<u>Bombay</u>			<u>Calcutta</u>				<u>Delhi</u>			
<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>
73.3	79.5	79.8	83.2	82.6	81.7	80.5	63.6	68	64	59.5
<u>Madras</u>				<u>Lucknow</u>			<u>Kanpur</u>			
<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	
35.6	44.9	52	52	59.5	58.7	60.6	52.4	52.8	52.8	

The stocks of repaired sets in relation to telephones in service are generally good (in Calcutta 4,000 to 101,000 working).

At present junking is done after an inspection by a committee consisting of fairly senior staff. This might be done by the supervisor with random management checks. It is suggested that plastic parts be broken before they are sold for junk.

33.0 Distribution and trunk plant cables are now mostly buried, which is good practice. The problem in large cities is that growth and street widening create difficult conditions because each new cable means digging new ditches. Certainly in the center of cities serious consideration should be given to installing conduits through which additional cables can be pulled. Also in high density areas close to central offices, there is a possibility of using smaller diameter (higher gauge) cable.

34.0 The following samples of trunk circuit efficiency were encountered during my travels:

Type of circuit	Distance	% of time circuits in working order			
		1961	1962	1963	1964
Physical circuit	75 miles (ND-Jind)	94%	95%	94%	91%
	125 " (ND-AB)	85%	84%	95%	91%
Open wire carrier	200 " (ND-JP)	95%	93%	94%	93%
	400 " (ND-JPR)	86%	90%	93%	82%
	1,000 " (ND-BY)	90%	86%	92%	88%
Symmetrical cable carrier	45 " (LW-KP)	98%	98%	98.5%	98.5%
Coaxial circuits	300 " (ND-LW)	98%	97.5%	91%	91%
	273 " (ND-KP)	98%	95%	93%	98%
	510 " (ND-VS)	-	-	91%	90%
	1,000 " (ND-CA)	-	-	87%	87%

Coaxial cables have suffered considerable troubles due to lightning and physical damage due to wash outs and other mechanical interference. The loss of time will be reduced in the future as a result of improved techniques and construction practices e.g. copper wire is now being laid above coaxial cable for protection from lightning.

34.1 Efficiency percentage of Trunk
Circuits on Routine Tests

<u>Circuits</u>	<u>Average for the Year 1964 (Jan. - Dec.)</u>
1. Bombay-New Delhi 1	93%
2. Bombay-New Delhi 2	90%
3. Bombay-New Delhi 3	94.5%
4. Bombay-Madras 1	89.7%
5. Bombay-Madras 3	88.5%
6. Bombay-Madras 5	89%
7. Bombay-Poona 1	95.5%
8. Bombay-Poona 2	92%
9. Bombay-Poona 3	88.3%
10. Bombay-Poona 5	91.7%

These figures reflect averages of routine testing. The results of these tests should go to all managers and should be monitored from the head office.

35.0 There follows a statement of total telephones now working in India:

<u>Year</u>	<u>Total Telephones</u>	<u>Telephones on Metered Rate</u>		<u>Telephones on Flat Rate</u>
		<u>Total No.</u>	<u>Increase during the year</u>	
1959-60	419,000	292,083	-	126,917
1960-61	464,949	318,813	26,730	146,136
1961-62	514,381	369,391	50,578	144,990
1962-63	593,546	431,832	62,441	161,714
1963-64	681,179	508,015	76,183	173,164

Summary of Recommendations Covered in Report

1. Separate classification of inside men into installers and maintenance men for accounting and control purposes.
2. Periodic report of average time to clear troubles.
3. Periodic analysis of all customer complaints classified by reason.
4. Consider publishing directories at 9 or 12 month intervals instead of 6 months.
5. Deliver directories to customers' premises.
6. A trial of a complete classified directory containing all business customers instead of only those who pay.
7. Ensure provision of facilities for point to point leased direct lines whenever trunk relief is planned and survey large customers for possible use to relieve over-loaded central offices.
8. Establish a small Engineering Sales and Service force to help large customers take full advantage of telephone and telex service offerings.
9. Maintain monthly record (sample) of manual operators speed of answer.
10. Change accounting procedures to classify properly construction expenditures.
11. Introduce recorded announcement in call queuing.
12. Consider organization re-alignment in view of rapid growth of Post Office and Telephone Telegraph functions so that responsibilities are delegated to middle and lower management levels.
13. Establish simple production indices to aid personnel control and supervision.
14. Establish small group with access to management to keep in touch with all job evaluations including geographic wage levels and pay scales for new jobs. Comparison with other government classifications and jobs in private sector is also important, as well as quality of departmental training procedures.
15. Establish a simplified billing procedure.
16. Use bill inserts to get across service messages to the public, such as off peak calling, use of directory, new service introductions.

17. Segregate extremely doubtful and long overdue final bills by charging to a reserve for uncollectable debts.
18. Eliminate registered mail notices of disconnection for non-payment of bills.
19. Provide for junking old equipment by repair supervisor with random spot checks.
20. Service trial of cable conduit in large cities to avoid repeated digging.
21. Distribute periodic transmission measurements done by central staff to all general managers.
22. Periodic report of trunk failures on routine tests.
23. Distribute monthly results of each area manager to all area managers to stimulate competition.
24. Recommended accounting changes should provide for internal audits of results.
25. Use part time employees to help under peak load conditions.
26. Consider use of smaller sized copper conductors in the large underground cables feeding high density telephone areas close to exchanges in the main cities.

Percent calls lost, subdivided by
principal causes
Freedom from interruptions
Dial tone delays
Speed of connection
Freedom from congestion
Transmission characteristics

b) In regard to customer relations, data should be collected on:

A breakdown of complaints
Waiting time for new connections
What priorities are given for business or other
categories of urgent new connections

c) In regard to interurban toll services, data should be
obtained covering:

Operator answering time
Hours of toll circuit outages per month per
thousand kilometers of toll circuits
Percentage of circuits found satisfactory on
routine tests
Delays in establishing toll connections
Transmission quality

2. The economy of the present operations of the IP&T Department should be studied on the basis of:
 - a) An examination of the number of employees in relation to different categories of the plant (e.g. number of maintenance personnel per thousand lines of automatic equipment).
 - b) Training
 - c) Efficiency of utilization of labor.
3. A concise judgment of the adequacy of future planning is required to determine that it is well directed towards improving telecommunications service to business and industry. This matter should be considered in relation to:
 - a) Local service
 - b) Interurban service
4. An examination should be made of the routine returns and materials now collected by the IP&T to give information on their telecommunication services. Recommendations regarding additional information and material which it is considered desirable to obtain should be made to the Bank.

I understand that you intend to combine this assignment with other personal travel and that you will proceed to New Delhi from Taiwan and furthermore that you will spend some time in Europe after completion of your work in India and before returning to the United States. You will keep a reasonable record of the time you spend during this period on preparing your report on your findings and I understand that you expect to be able to complete this report by early May 1965.

Cleared with and cc: Mr. G. Votaw
cc: Messrs. Aldewereld, Chadenet, Ripman, Marshall (2), Grant, Elofson,
and Kaupisch (4)
Miss J. Van Gasse (2)
Operational Files (3)

CF:hak

POSTS AND TELEGRAPHS DIRECTORATE

1.	Shri Jagdeesh Prasad	Member (Telecom. Development)
2.	" S.K. Kanjilal	Member (Telecom. Operations)
3.	" S.N. Ranganathan	Dy. Director General (Stores & Maintenance)
4.	" Rama Kant	Dy. Director General (Switching)
5.	" G.U. Menon	Dy. Director General (Long Distance)
6.	" S.M. agarwal	Dy. Director General (Telegraphs)
7.	" P.A. Sankaranarayan	Dy. Chief Engineer (Coordination Planning)
8.	" K.R. Nair	Director Phones (Engineering)
9.	" D.S.D. Joshi	Director Phones (Traffic)
10.	" C.A. Reddi	Dy. Chief Engineer (Training)

TELECOMMUNICATION RESEARCH CENTRE

1.	Shri C.P. Vasudevan	Director of Research
2.	" H.P. Taskar	Dy. Director (Switching)
3.	" T.S. Subramanian	Dy. Director (Transmission)
4.	M. B.H. Shanta	Dy. Director (Transmission)
5.	Shri K.C. Ramadoss	Dy. Director (Transmission)

TELECOMMUNICATIONS DELHI

1.	Shri D.M. Ramchandani	General Manager Telephones
2.	" S.K. Rana	Dy. General Manager (Eng.)
3.	" A. Bhattacharya	Dy. General Manager (Administration)
4.	" G.G. Barve	Divisional Engineer (Phones, His Hazari Exchange)
5.	" P. Kameswara Rao	Regional Director (Telecom.)
6.	" S. Raghavachari	Chief Accounts Officer (Telephone Revenue)

7. Shri D.R. Bahl Asstt. General Manager (Commercial)
8. " P.N. Kaul Asstt; General Manager (Trunks)
9. " K.L. Goyal Accounts Officer (Trunk & Foreign Revenue)
10. " B.K. Berry Accounts Officer, Telephone Revenue
(Local Revenue)

TELECOMMUNICATIONS CALCUTTA

1. Shri J.R. Sen Gupta General Manager (Telephones)
2. " H.P. Mukherjee Dy. General Manager (Maintenance)
3. " A.K. Ghosh Divisional Engineer (Telephones)
4. Capt. G.C. Chatterjee Divisional Engineer (Trunk Exchange)
5. Shri S.C. Samuel Asstt. Engineer (Repair Shop)
6. Mrs. Rodrigues Asstt. Traffic Supdt. (Auto Manual Services)

TELECOMMUNICATIONS MADRAS

1. Shri B.K. Anantaraman District Manager
2. " R.P. Subramaniam D.E. Phones (North)
3. " P.N. Subba Rao D.E. Phones (South)
4. " A.S. Iyer D.E. Phones (Equipmt. Plg. & Installation)
5. " T.R. Sethuraman D.E. Phones (Administration)

TELECOMMUNICATIONS HYDERABAD

1. Shri S.G.K. Reddi District Manager
2. " A.V. Rayudu D.E. Phones (Internal)
3. " K.S. Raghunathan D.E. Phones (External)

(a) Bombay Telephones

Shri I.S. Muthanna	General Manager
" S.Y. Nadkarni	Dy. General Manager (Planning)
" V.A. Dutt	D.E.T. Auto Installation
" J.B. Vatcha	D.E.T. Auto Installation

(b) Bombay Telephone Workshop

Shri I.K. Gupta	General Manager, P&T Workshops
" I.I. Wagle	Manager, Bombay Telephone Workshops
" Langla Prasad	Sr. Engineer Production
" George Mani	Asstt. Manager Workshop

(c) Rajasthan P&T Circle, Jaipur

Shri H.C. Mathur	D.E.T. Jaipur
" D.S. Mangpal	Deputy Director Engineering, Rajasthan P&T Circle.

QUALITY OF SERVICE TO LOCAL TELEPHONE SUBSCRIBERS.

Telephone systems.	Bombay.				Calcutta.				Delhi.				Madras.				Lucknow.				Kanpur.			
	61	62	63	64	61	62	63	64	61	62	63	64	61	62	63	64	61	62	63	64	61	62	63	64
For years:																								
1. Percentage calls completed.	78	71.0	71.8	70.3	62.7	62.4	65.1	64.3	-	65.4	65.0	59.7	53	60	63	65	-	62.7	65.9	66.5	-	58.4	62.3	65.9
2. Percentage calls lost.	22	29.0	28.2	29.7	37.3	37.6	34.9	35.7	-	34.6	35.0	40.3	47	40	37	36	-	37.3	34.1	33.5	-	41.6	37.7	34.1
(a) Plant engaged.	3.4	3.4	4.3	5.9	0.7	0.64	1.05	-	1.2	1.0	1.0	6.0	3.0	3.0	2.0	-	4.5	4.5	6.0	-	0.9	2.2	0.6	
(b) No tone	0.1	0.4	0.8	0.9	1.7	2.3	1.9	2.7	-	3.0	2.0	1.1	-	-	-	-	0.2	0.1	0.1	-	1.2	0.3	2.9	
(c) Wrong number.	-	-	-	-	0.1	0.1	0.1	0.2	-	1.0	1.0	0.5	6.0	4.0	2.0	2.0	-	-	-	-	-	0.8	1.4	0.5
(d) Number engaged.	13.0	20.9	16.8	18.2	29.8	30.23	27.9	26.9	-	22.0	23.0	29.9	30.0	29.0	29.0	-	25.7	23.7	20.5	-	24.8	21.8	20.2	
(e) N.U. Tone.	-	-	-	-	0.4	0.2	0.2	0.25	-	0.4	1.0	0.5	-	-	-	-	0.2	0.2	0.3	-	0.2	0.1	0.1	
(f) No reply.	4.9	3.6	4.6	3.5	3.8	4.3	3.9	4.4	-	6.3	6.0	5.6	2.0	2.0	2.0	2.0	-	5.8	5.0	5.9	-	5.4	5.6	4.9
(g) Others.	* 0.6	* 0.7	* 1.7	* 1.2	0.1	0.2	0.3	0.2	-	0.7	1.0	1.7	3.0	2.0	1.0	1.0	-	0.9	0.6	0.7	-	8.3	6.3	4.9

* Includes wrong No.

Waiting list as on 31st December of the years.

Item.	Bombay District.				Date of oldest application.	Calcutta Dist.				Date of oldest application.	Delhi District.				Date of oldest appln	Madras District.			Date to be added appn
	1961	1962	1963	1964		1961	1962	1963	1964		1961	1962	1963	1964		1961	1962	1963	
1. General category.	11635	12350	12515	12516		32600	38520	44310	53496	21.11.1957	30585	34582	32675	35986	21.10.1956.	9512	12697	12576	16% ¹⁵⁹
2. O.Y.I. category.	20066	26172	35135	40370	31.12.55	--	Current	--		Current.	Current.	34	249	1411	1.5.64	Infra. not available.	472	176	19 ¹⁴ %
3. Exempted category.	1917	2340	2405	2643	30.9.56	1360	1600	1846	1976	12.5.1959.	327	617	990	1482	27.4.1958.	255	270	314	148 ⁵⁷ %
Total:	33618	40862	50055	55529	-	33960	40120	46156	55472	-	30912	35266	33914	38879	-	9767	9165	13483	12900

Number of lines to be added:

Name of District.	Year 1964-65.	Year 1965-66.	Years 1966-1971.
1. CALCUTTA	3800	10400	75000
2. BOMBAY	6900	16700	75000
3. MADRAS	5500	2000	30000
4. DELHI.	3500	3800	75000

HELD ORDER PROCEDURES

Due to all-round development in the country in various fields, the demand for telephone connections are generated at a much faster rate than our development programme. The supplies fall short of the demand. The result is that the available telephones are to be rationed out in an appropriate manner so as to meet emergent and important demands which have justifiable claims on priority basis. A scheme known "Own Your Telephone Scheme" is in force on 11 stations in the country; these are major important towns in the country such as Bombay, Calcutta, Delhi, Madras, Ahmedabad, etc. Under this scheme, the applicant has to pay Rs. 2,000/- (Rs. 2,500 in case of Calcutta and Bombay) as an advance rental for a period of 20 years. The applicants applying under this scheme are given telephone connections under priority over the applicants under the general category. In the telephone systems where the OYT scheme is in force, the OYT applicants are first provided connections. Normally 70% of the available capacity is reserved for giving connections under the OYT Scheme. After meeting the OYT demands, if the spare capacity still permits, the applicants under the general category are also provided with telephone connections.

In order that the applicants who cannot pay the OYT deposit and have a justifiable claim, a certain quota of the spare capacity is reserved for the applicants under the exempted category at OYT stations. This quota is 30% of the total spare capacity. The exempted category applicants consist of the applicants falling under Press, Doctors, Public men, Public Institutions, Small Scale Industries, etc.

At the stations where the OYT scheme is not in force, the telephone connections are also given to certain priority categories of applicants.

This priority category consists of Press, Doctors, Publicmen, Public Institutions, Small Scale Industries, etc. The quota reserved for priority category applicants is 30% of the total spare capacity.

At OYT as well as non-OYT stations demands from important commercial and industrial organizations can also be met on priority on the recommendation of Central and State Governments at the discretion of the Heads of P&T Circles/Districts. Those industries which earn foreign exchange or save foreign exchange are given due consideration in the matter of allotment of telephone.

Telephone Advisory Committee consisting of important persons from the public, trade, commerce, press, etc. have also been constituted at important places. The function of these committees is to advise the local telephone exchange administration on important telephone matters such as telephone allotment on priority to certain category of applicants, extension of telephone services, etc.